

STRUCTURE OF THIS MICROCARD (BASIC INSTRUCTIONS)

A02 = How to use this microcard		1	2	3		4
A01 = Structure of microcard					SIS	
B01 = Trouble-shooting chart	-A-	***X*	X*XXX	XXXXX	XXXXX	*XXXX X
	-B-	*XXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-C-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-D-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	-E-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XX
	-F-	XXXXX	XXXXX	XXXXX	XXX	
	-G-	XXXXX	XXXXX	XXXX		
	-H-					
	-J-					
	-K-					
	-L-					
	-M-					
N01 = Service information	-N-	*XXXX	XXXXX	XXXXX	XXX	*X XX*
		12345	67890	12345	67890	12345 678
			1		2	
						Index

N28 = Table of contents and publication information


- 1 = Special features
- 2 = Safety and precautionary measures
- 3 = Testers and tools
- 4 = Installation position of components

- a. Read from left to right.
- b. Title of micropicture (appears on each micropicture).

E16	Product/component/test step	
	Coordinate	

c. Limits of section

			
Beginning	Mid-section	End	One-page section

A01		
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HOW TO USE THIS MICROCARD

Trouble-shooting instructions for

System: EI-K

Descriptions, photos, terminal designations and special features refer to the following vehicle:

Volvo 480, 440 Turbo with 1.8 l/4-cylinder engine B18 FT → 4.86 or → 1.89

These basic instructions are comprehensive trouble-shooting instructions. They must not be used as vehicle-specific instructions. Caution! Descriptions and photographs may deviate from the vehicle-specific brief instructions.

Mandatory set values, terminal assignments and special features should be taken from the vehicle-specific brief instructions only. For brief instructions, see table of contents Microcard KFZ-00..

A02		
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SAFETY AND PRECAUTIONARY MEASURES

Be sure to observe safety and precautionary measures so as to avoid risk to persons and to prevent damage to the engine, trigger boxes, control units or the ignition system.

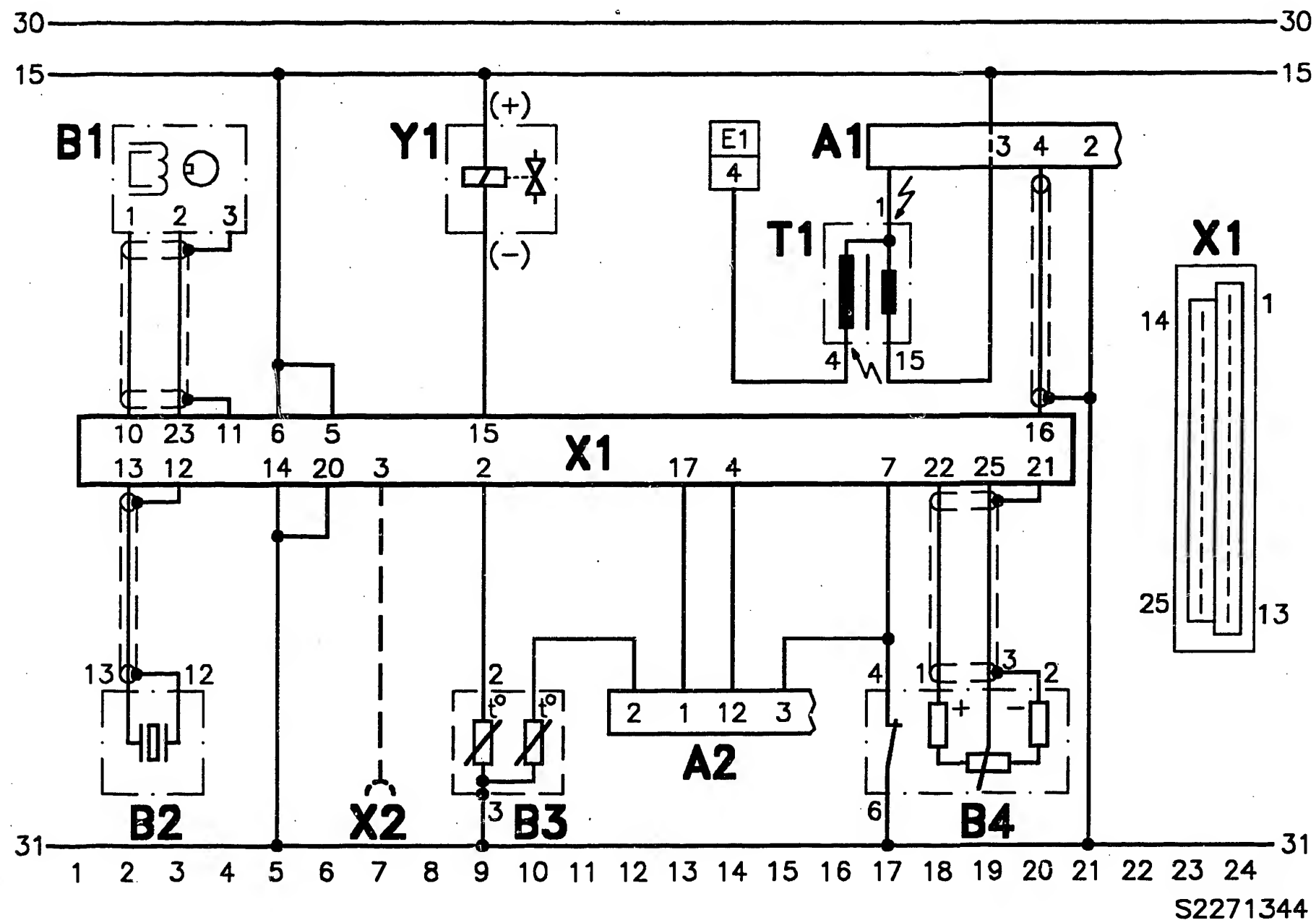
CAUTION!

High-energy ignition system with dangerous high and low voltages!

Touching live parts or terminals may be highly dangerous (both on the primary and secondary sides).

In this connection we would like to point out that VDE Regulations (in particular VDE 0104/7.67) or the pertinent local regulations are to be complied with when working on or testing the ignition system.

For production reasons:
continued on the following
coordinate.



High-tension arrows: Caution 400 V...25 kV

T1 = Ignition coil

X4 = Trigger-box plug

SAFETY AND PRECAUTIONARY MEASURES (CONTINUED)

Taking the terminal diagram of an electronic ignition system as an example, the hazardous locations are marked with high-tension arrows.

SAFETY AND PRECAUTIONARY MEASURES
(CONTINUED)

Never start engine without battery securely connected (battery terminals tightened).
Do not disconnect battery from vehicle electrical system with engine running.

Do not use a fast charger for starting the engine.
Provide starting assistance only with second 12 V battery and jump leads.
Caution! Owing to non-standardized requirements of vehicle manufacturers with regard to electronic products, we advise against using a 24 V battery for starting assistance.

When charging the battery in the vehicle or providing starting assistance, follow the operating instructions for the fast charger as well as instructions of the vehicle manufacturer.

Disconnect battery from vehicle electrical system before charging or fast-charging.

Incorrect polarity of the supply voltage, e.g. through incorrect connection of the battery or ignition coil, may lead to the destruction of a control unit.

Do not connect or disconnect wiring-harness plugs from control units or trigger boxes with the ignition on.

Remove control units at temperatures above + 80° C (paint-drying installation).

Remove control units before carrying out electric welding work.

SAFETY AND PRECAUTIONARY MEASURES
(CONTINUED)

When testing compression, detach trigger-box plug or permanently connect ignition coil term. 4 to ground with auxiliary cable (hazardous high tension, insulation damage on ignition coil, ignition distributor, ignition harness).

Note:
Auxiliary cable must feature at least 2 k Ω interference suppression, e.g. sleeve-type suppressor (5 k Ω)
0 356 500 001.

Prescribed ignition coil (see part no.) is not to be replaced with a different ignition coil.

An interference-suppression capacitor is not to be connected to term. 1 of the ignition coil.

The positive terminal of the battery is never to be connected to term. 1 of the ignition coil as this will destroy the trigger box.

Do not short-circuit term. 1 of ignition coil to ground (e.g. to switch off engine), as this will destroy the ignition coil and possibly also the trigger box.

Ignition cable from ignition coil and ignition distributor term. 4 must not be detached during operation.

There must be no voltage flashover from term. 4 of the ignition coil to term. 1 and term. 15 of the ignition coil.

The secondary side of the ignition system must feature at least 2 k Ω interference suppression, so as to prevent destruction of the trigger box.

SAFETY AND PRECAUTIONARY MEASURES
(CONTINUED)

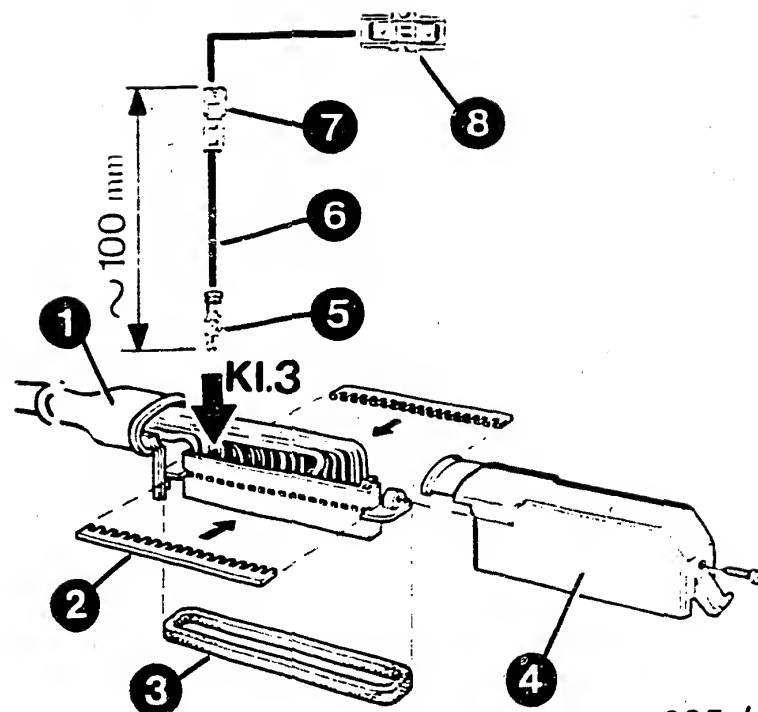
Incorrect indication of engine speed, dwell angle and ignition point:

With this ignition system (trigger box with current limitation) there is a possibility of an incorrect indication of engine speed, dwell angle and ignition point on testers.

Refer to coordinates N10 for more detailed information

TESTERS AND TOOLS

Name	Designation	Part no.
Engine tester	e.g., MOT 206	0 684 000 206
Sleeve-type suppressor 5 k Ω		0 356 500 001
Multimeter	e.g. MMD 301	0 684 500 301
Evaluation unit (evaluation of self-diagnosis)		KDAW 9980
Resistance decade (univ. measuring unit)		commercially available
Set of test cables (case)		1 687 011 208
Test leads (for proper connection of testers to connectors)		KDZS 0004 KDZS 0005
Torque wrench Range 5...60 Nm		commercially available
Pressure/vacuum pump	e. g. Mityvac	commercially available
Control valve with pressure gauge (special accessory for ID test bench ZVS 50)		1 687 417 069
O R ALDA tester (diesel workshop)		0 684 200 610
O R Pressure gauge Measurement range 0..1600 hPA Quality class 0.6 Resolution 10 hPA		commercially available

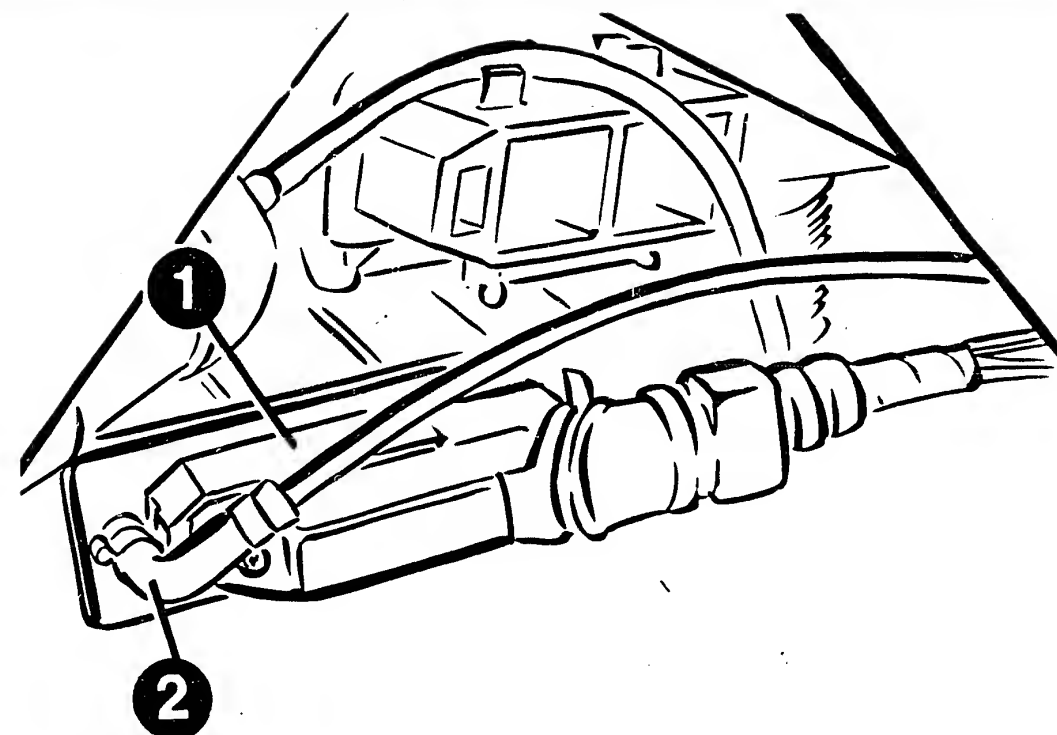


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- | | |
|--------------------------------|---------------|
| 1 = EI-K control-unit plug | 1 284 477 121 |
| 5 = Contact spring (Minitimer) | 6 210 .. |
| 6 = Lead 0.75 mm ² | 1 901 355 880 |
| 7 = Blade receptacle (6.3 mm) | 8 781 360 810 |
| 8 = Insulating coupling | |

TESTERS AND TOOLS (CONTINUED)

Test lead (user manufacture as per sketch), items 5...8, is installed for flashing-code evaluation in the EI-K control-unit plug.



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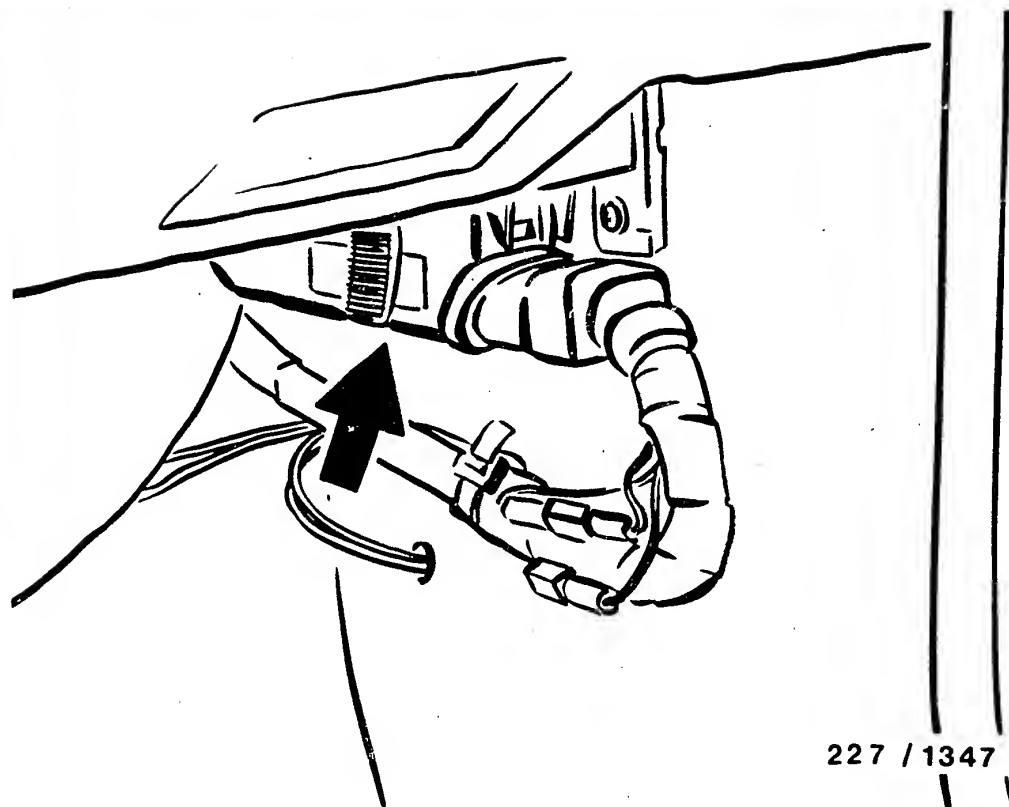
- | |
|--------------------------------|
| 1 = EI-K control unit |
| 2 = Vacuum/pressure connection |

INSTALLATION POSITION OF COMPONENTS

The EI-K control unit is located in the center console, right (pushed in).

Removal instructions:

Remove trim.



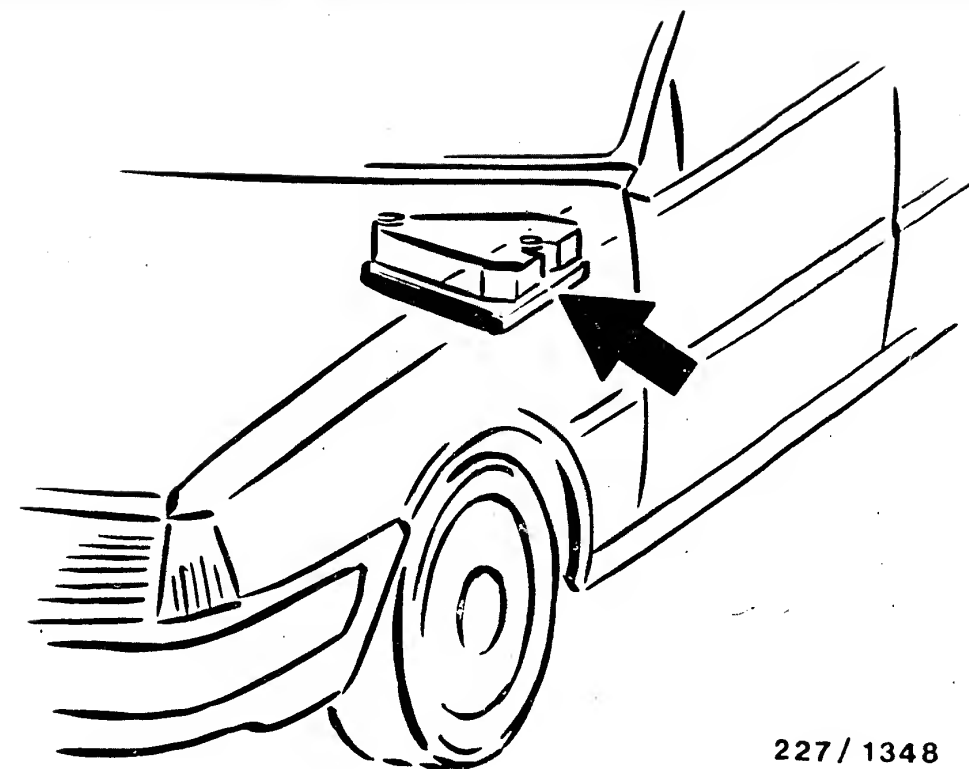
Arrow = LH-Jetronic control unit

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

LH-Jetronic control unit is located in passenger-side footwell, front right.

Removal instructions:

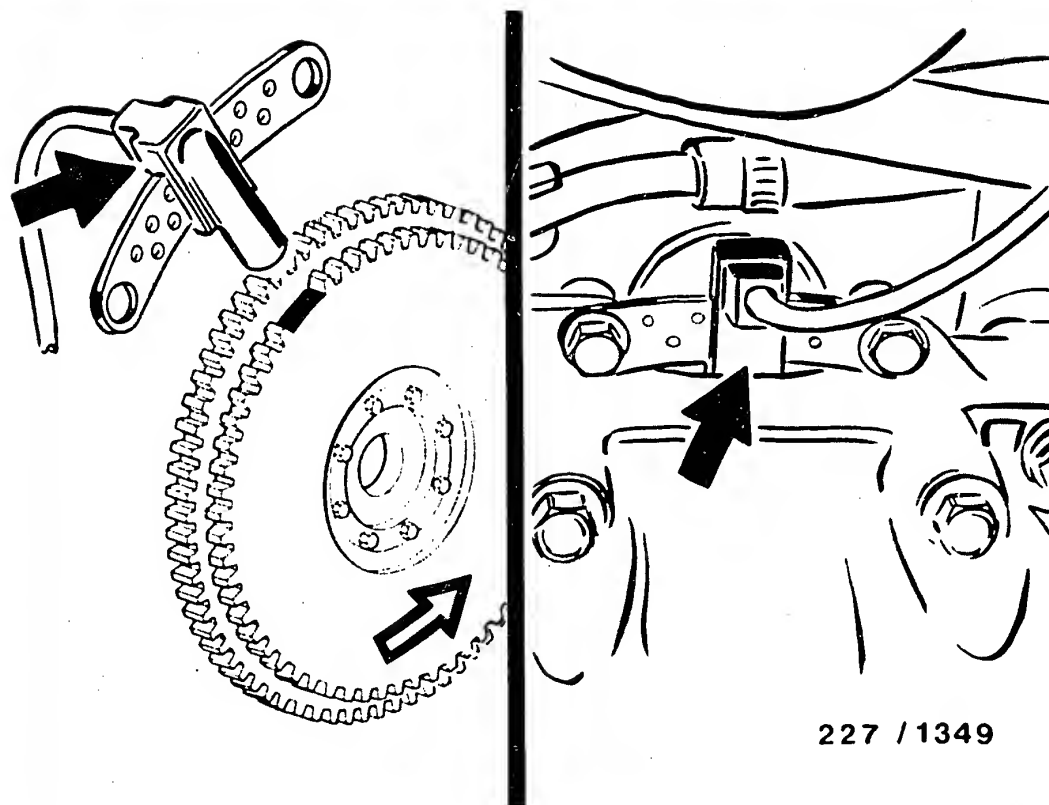
Remove trim.



Arrow = Relay/fuse box

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The relay/fuse box is located on the left in the engine compartment behind the bulkhead.

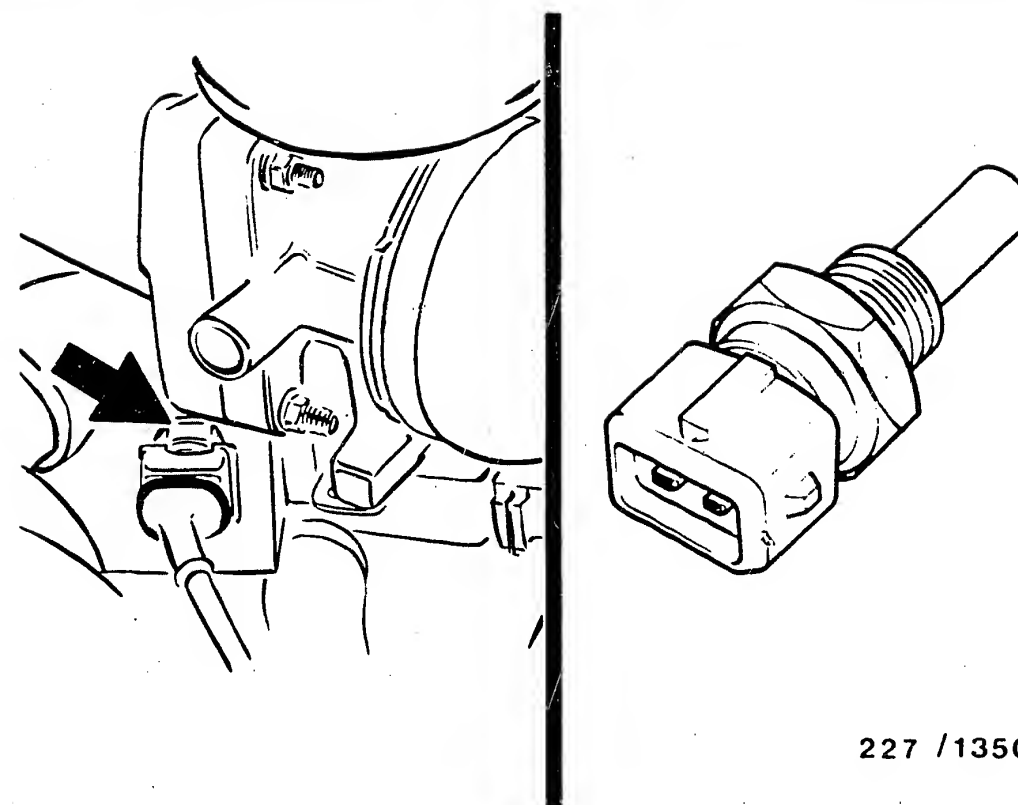


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Arrow = Engine-speed and reference-mark sensor

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The engine-speed and reference-mark sensor is located at the clutch housing.

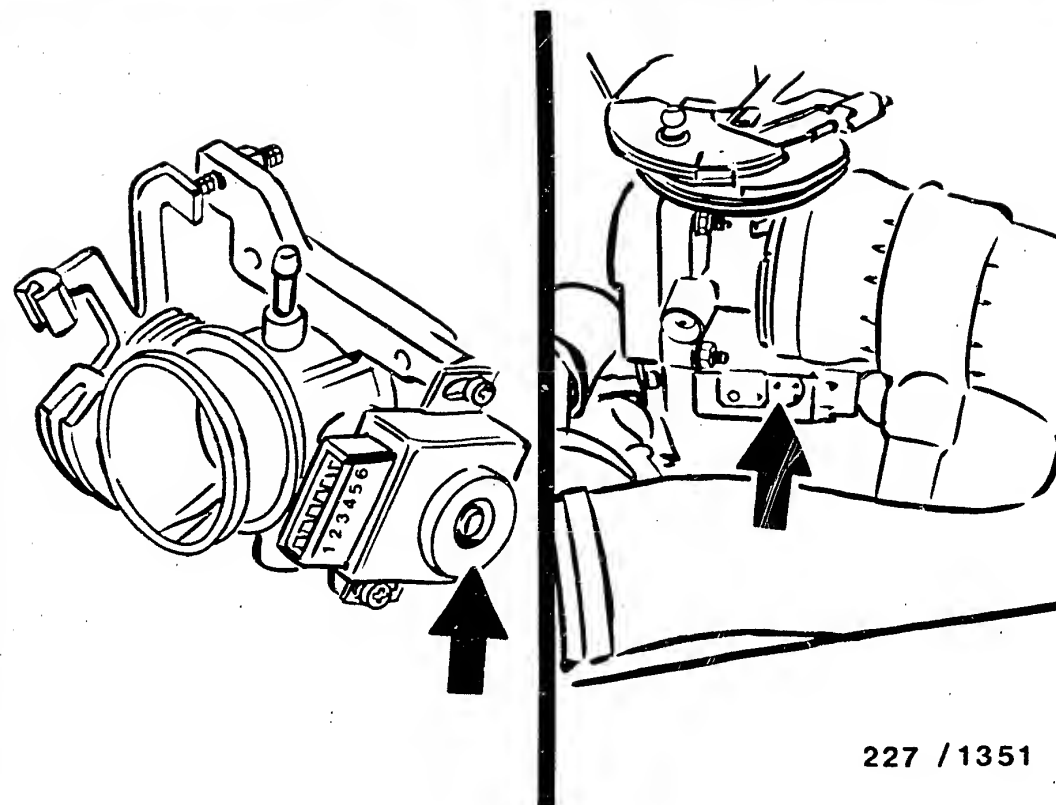


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Arrow = Temperature sensor (coolant)

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

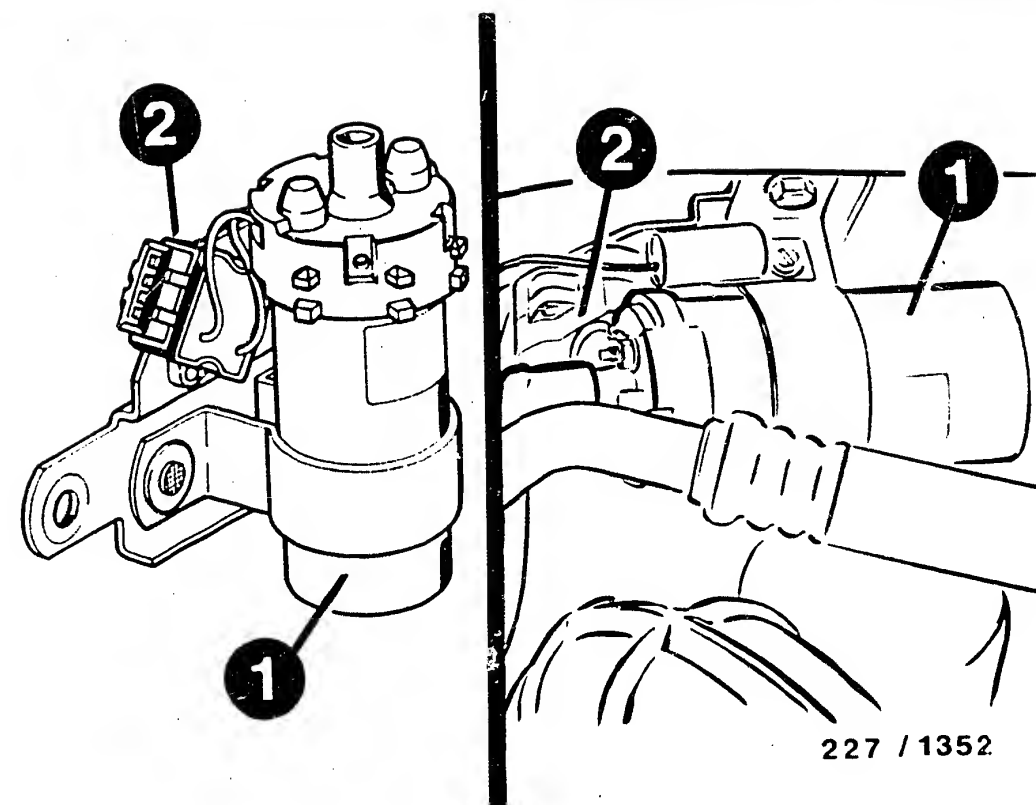
The temperature sensor (coolant) is located at the cylinder head beneath the throttle valve.



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INSTALLATION POSITION OF COMPONENTS (CONTINUED)

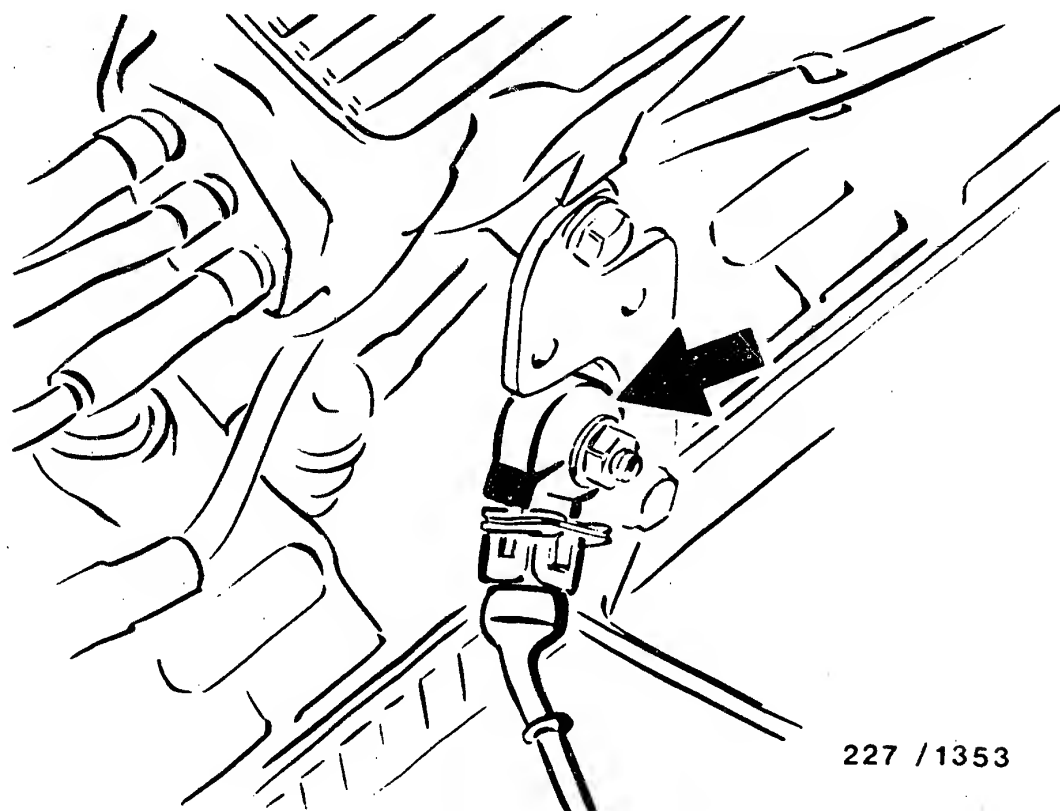
Arrow = Throttle-valve switch (idle) with potentiometer



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INSTALLATION POSITION OF COMPONENTS (CONTINUED)

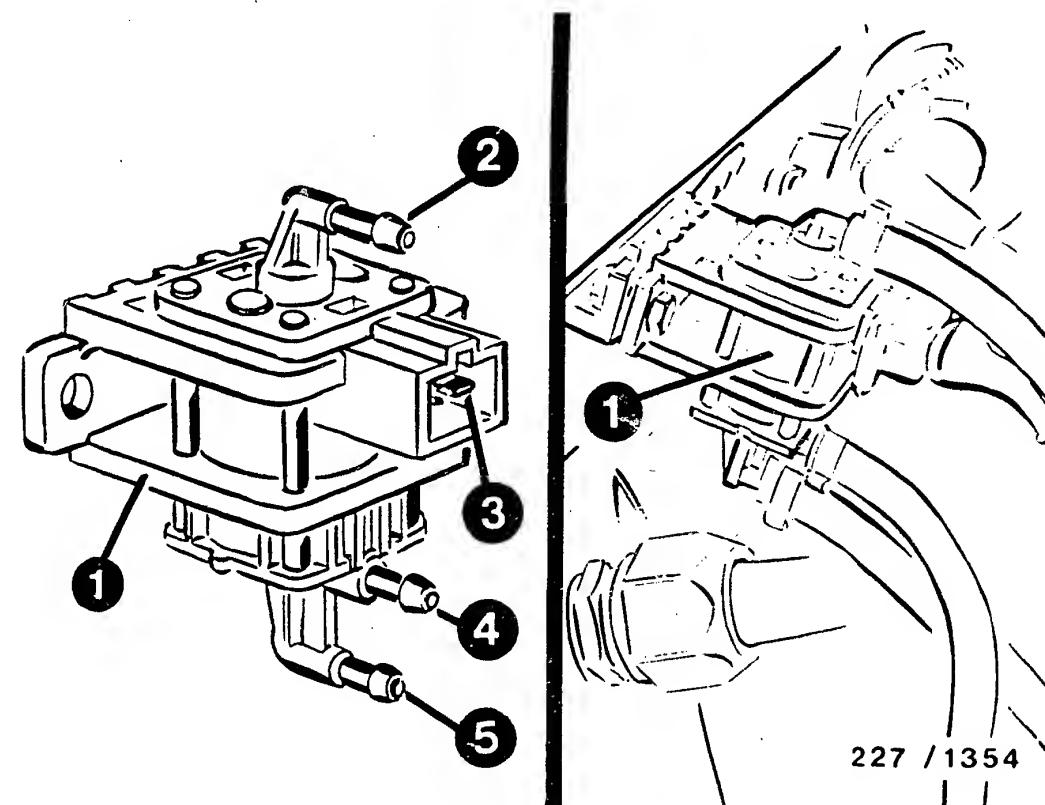
1 = Ignition coil
2 = Trigger box



Arrow = Knock sensor

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

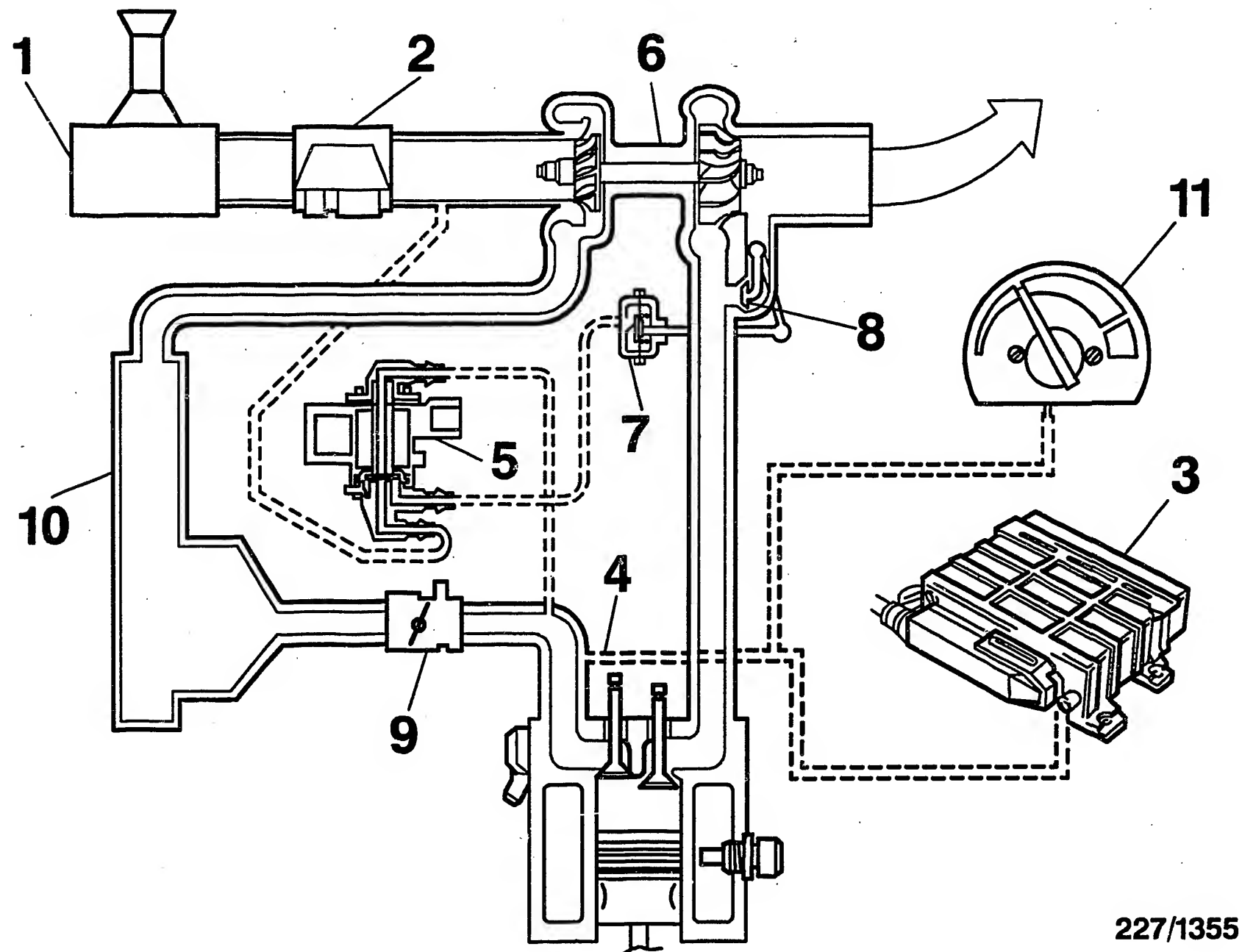
The knock sensor is located at the cylinder head between cylinders 2 and 3 (behind idle actuator).



- 1 = Charge-air-pressure frequency valve
- 2 = Intake pressure (charge-air pressure) after throttle valve
- 3 = Electrical connection (old version)
- 4 = Connection to turbo-supercharger (diaphragm-type control valve)
- 5 = Connection to air inlet (between hot-wire air-mass sensor and compressor of turbo-supercharger)

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The charge-air-pressure frequency valve is located at the engine bulkhead.



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DIAGRAM OF AIR LINES (charge-air-pressure regulation)

- 1 = Air filter
- 2 = Hot-wire air-mass sensor
- 3 = EI-K control unit
- 4 = Charge-air-pressure connection
- 5 = Charge-air-pressure frequency valve
- 6 = Exhaust turbo-supercharger
- Dashed line = = = = signifies vacuum / charge-air pressure

- 7 = Diaphragm-type control valve
- 8 = Turbo-supercharger relief valve
- 9 = Throttle valve
- 10 = Charge cooler
- 11 = Charge-air-pressure gauge

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM

The TROUBLE-SHOOTING CHART starts with Coordinate B03 and contains customer complaint (fault symptom/fault characteristic feature) together with several possible causes in each case (component faults) and coordinate information for detailed trouble-shooting. If no coordinates are given, this is because the causes concerned do not require any test instructions.

In the event of a clearly established customer complaint, proceed consecutively and step by step as indicated in the trouble-shooting instructions in the stated sequence of possible causes.

Trouble-shooting should always be commenced with self-diagnosis (if provided) or with the universal test adapter (if possible). Only then should trouble-shooting be continued in line with the trouble-shooting chart.

In the event of a customer complaint which is not clear-cut, all causes indicated in the trouble-shooting chart must be tested. In order to avoid incorrect measurements, all causes are to be checked in the specified sequence (on account of the interdependence of test steps).

HOW TO USE TROUBLE-SHOOTING CHART AND TROUBLE-SHOOTING PROGRAM (CONTINUED)

The TROUBLE-SHOOTING PROGRAM contains all system and component tests indicated in the trouble-shooting chart. It is sub-divided into three rows of boxes.

The left-hand column contains test instructions and set values.

The center column contains information on trouble-shooting and fault elimination.

The right-hand column contains pictures/connection diagrams linked to the text together with explanatory notes.

If the questions posed in the left-hand column can definitely be answered with "yes", trouble-shooting is to be continued with the next box below.

If the answer to the question is "no", the center column must be applied and the tests performed in the sequence indicated there.

Following fault elimination, repeat test as a check.

TEST PREREQUISITES:

- Battery fully charged
- Engine in proper mechanical working order (e.g. compression, valve clearance etc.)
- Engine at operating temperature of approx. +80°C (if necessary)
- Proper connection of all connectors of wiring harness

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on.
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

												Cause (component fault)	Coord.
*	*	*	*	*	*	*	*	*	*	*	*	Self-diagnosis	B05
*				*								H.T. end	C25
*												Firing sequence	—
*				*								Ignition coil	C27
*												Voltage, trigger box	D01
*												Primary circuit	D03
*												Voltage, EI-K control unit	D05
*												Insulation, engine-speed and reference-mark sensor	D07
*												Internal resistance, engine-speed and reference-mark sensor	D09
*												Voltage, engine-speed and reference-mark sensor	D11
*												EI-K control-unit function	D13
*												Contact resistance	D19
*												Engine-speed signal	D21
*												Primary signal	D23
		*	*	*								Throttle-valve switch (idle)	D25
								*				Full-load signal	E03

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on (dieseling).
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

												Cause (component fault)	Coord.
				*								Charge-air-pressure frequency valve	E05
				*								Voltage, trigger box (engine idling)	E07
				*								Voltage, ignition coil (engine idling)	E09

HOW TO USE SELF-DIAGNOSIS, SELF-DIAGNOSIS TEST TABLE AND TROUBLE-SHOOTING PROGRAM

This vehicle is equipped with a control unit which has a self-diagnosis feature. Therefore, start trouble-shooting with the self-diagnosis.

How to activate the self-diagnosis is described starting on Coordinate B11. The self-diagnosis test table starting on Coordinate B13 contains:

- Fault indication (flashing code)
- Components or system functions under test
- Test instructions/test conditions
- Connection terminals
- Set-value specifications
- Coordinate references for trouble-shooting and fault rectification in the subsequent self-diagnosis trouble-shooting program.

HOW TO USE SELF-DIAGNOSIS, SELF-DIAGNOSIS TEST TABLE AND SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (CONTINUED)

The self-diagnosis trouble-shooting program is split up into 3 columns as of Coordinate B25.

The left-hand column contains test instructions and set values.

The center column contains information on trouble-shooting and fault elimination.

The right-hand column contains pictures/terminal diagrams belonging to the text together with explanatory notes.

If the questions posed in the left-hand column can definitely be answered with "yes", trouble-shooting is to be continued with the next box below.

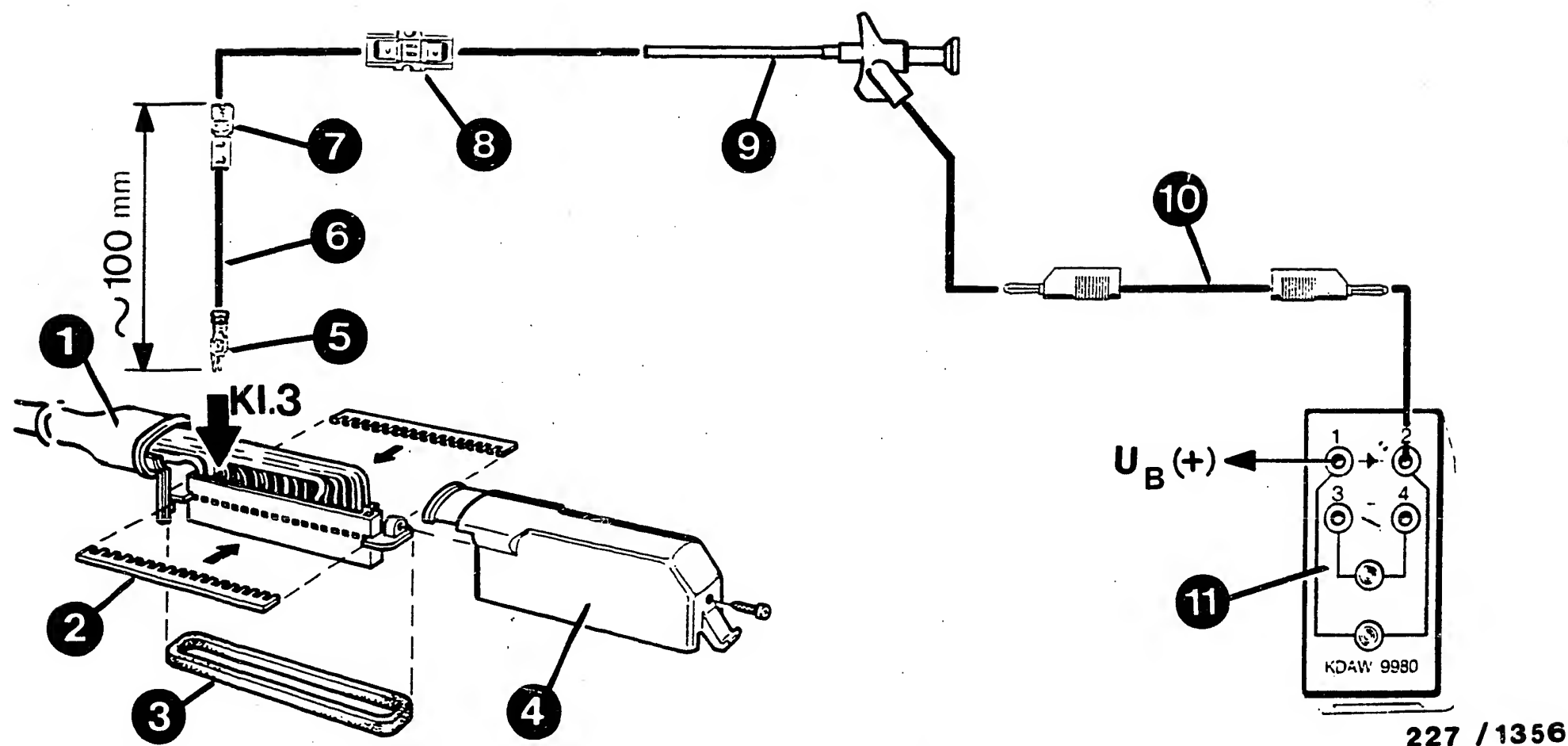
If the answer to the question is "no", the center column must be employed and the tests performed in the sequence indicated there.

If the self-diagnosis indicates a fault, but there is no system or component fault, the control unit is to be replaced.

If no further system-specific faults are indicated by the self-diagnosis and the customer complaint (fault symptom) has still not been eliminated, trouble-shooting must be continued with the trouble-shooting chart as of Coordinate B03.

Test prerequisites:

Engine can be run at 4000 min⁻¹.



1 = EI-K control-unit plug
2 = Stopping device
3 = Sealing strip
4 = Handle cover

5...8 = Test lead (user manufacture)
9 = Clamp-on test prod or similar
10 = Measurement lead
11 = Evaluation unit KDAW 9980

HOW TO USE SELF-DIAGNOSIS, SELF-DIAG. TEST TABLE AND TROUBLE-SHOOTING PROGRAM (CONT.)

Preparation for self-diagnosis

Detach EI-K control-unit plug and remove sealing strip, handle cover and locking device. Install user-manufactured lead, items 5...8 (see TESTERS AND TOOLS) in EI-K control-unit plug term. 3 or connect to evaluation unit KDAW 9980, socket 2.

Assemble EI-K control-unit plug and attach to control unit.

Connect evaluation unit, socket 1 to battery term. 30 (+). Ignition ON. Evaluation-unit lamp must light up. If lamp does not light up, check function of test lead including evaluation unit or renew EI-K control unit.

Note

Built-in test lead can remain in EI-K control-unit plug (attach free end to wiring harness for further diagnosis).

HOW TO USE SELF-DIAGNOSIS, SELF-DIAGNOSIS TEST TABLE AND TROUBLE-SHOOTING PROGRAM (CONTINUED)

Flashing-code evaluation

The self-diagnosis is output in the form of a flashing code. The flashing code consists of max. 6 flashing pulses. Refer to picture.

The flashing pulses are detected with the evaluation unit KDAW 9980 and evaluated (counted) by the person performing the test.

Note:
Hatched area in picture signifies voltage pulse present (evaluation-unit lamp lights up).

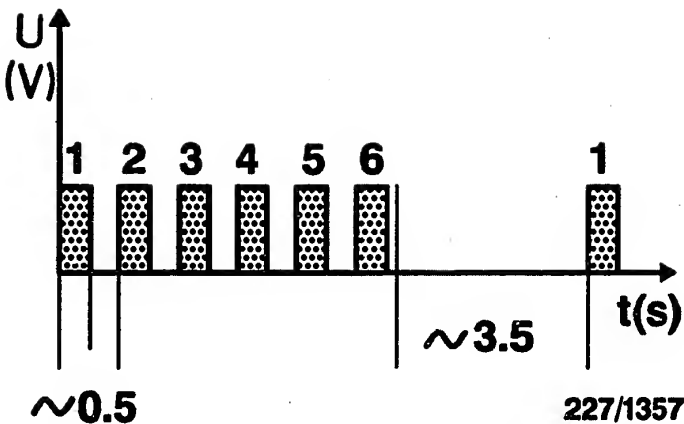
When idling, the flashing pulses and the subsequent pause both have a duration of approx. 0.5 s (depending on engine speed).

Transmission of the last flashing pulse is followed by a pause of roughly 3.5 seconds.

Flashing code 6 is presented in the picture as an example.

With this self-diagnosis, only 1 fault is ever indicated. The first-indicated fault must always be eliminated before other faults can be interrogated. Then perform test drive (see activation).

The EI-K control unit has a volatile memory. This means that the FAULT MEMORY is CLEARED with ignition OFF.



HOW TO USE SELF-DIAGNOSIS, SELF-DIAGNOSIS
TEST TABLE AND TROUBLE-SHOOTING PROGRAM
(CONTINUED)

A c t i v a t i o n o f
s e l f - d i a g n o s i s

Perform test drive on road/roller dynamometer
at engine speed in excess of 4000 min⁻¹ .
In doing so, briefly (at least 10 seconds)
depress accelerator pedal as far as it will go.

Then allow engine to idle.

The lamp of the evaluation unit flashes depending
on the fault.

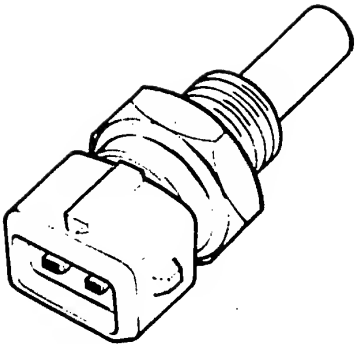
The flashing code can be evaluated or the fault
eliminated with the aid of the self-diagnosis
test table.

Self-diagnosis activation with subsequent fault
elimination must be repeated until the lamp of
the evaluation unit no longer flashes (knock
control is then O.K.).

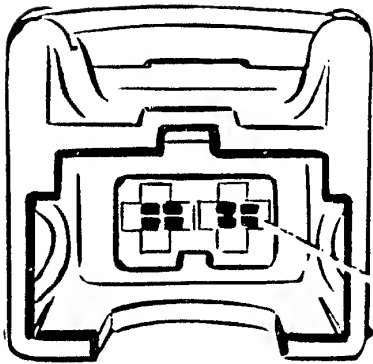
For production reasons:
continued on the following
coordinate.

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component / function Test instructions/conditions	Term.	Set values	Coor- dinate
2	<p>TEMPERATURE SENSOR (COOLANT)</p> <p>Detach temperature-sensor plug. Resistance, temperature sensor. See top picture.</p> <p>Visual inspection, temperature- sensor plug (oxidation, corrosion, contact-spring damage). See center picture.</p> <p>Detach EI-K control-unit plug. See bottom picture. Check temperature-sensor plug and EI-K control-unit plug for open circuit, short to ground and short to positive.</p>	<p>—</p> <p>2 2</p>	<p>see brief instruct- ions</p>	<p>B23</p>
3	<p>THROTTLE-VALVE SWITCH (IDLE) WITH POTENTIOMETER (LOAD PICK-OFF VOLTAGE TOO SMALL/LARGE)</p> <p>Visual inspection, throttle valve (dirt).</p> <p>Check throttle-valve basic setting.</p> <p>Throttle-valve-switch basic setting. Resistance, throttle-valve switch. Throttle valve in idle position. Open throttle valve approx. 1°</p> <p>Continued on next picture page</p>	<p>4 6</p>	<p>approx. 0 Ω infinity Ω</p>	<p>B27</p>

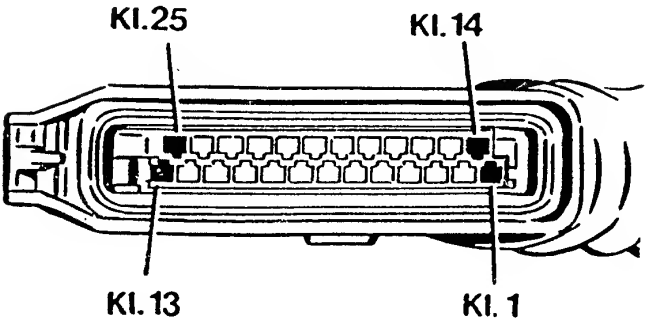


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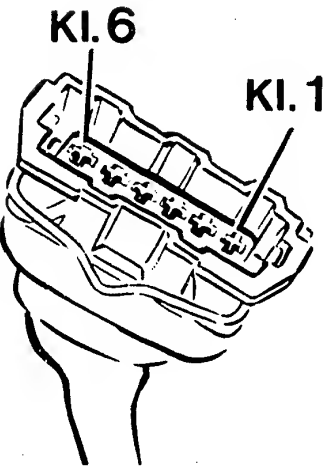
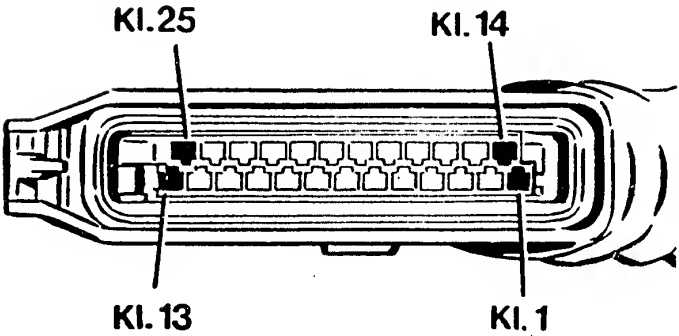
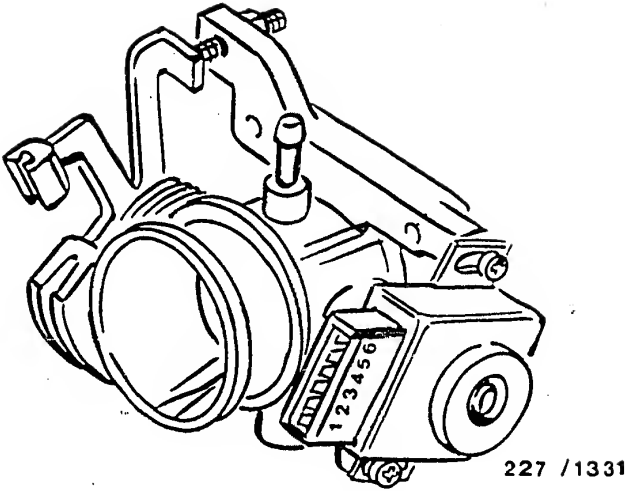
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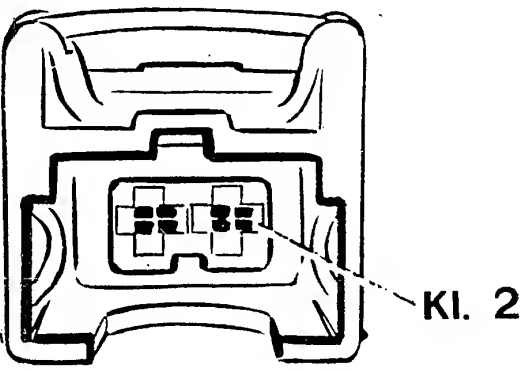
SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component / function Test instructions/conditions	Term.	Set values	Coordinate
3	<p>THROTTLE-VALVE SWITCH (IDLE) WITH POTENTIOMETER (LOAD PICK-OFF VOLTAGE TOO SMALL/LARGE) (continued)</p> <p>Resistance, throttle-valve potentiometer. See top picture.</p> <p>Resistance, EI-K control-unit plug and throttle-valve-switch plug. See center and bottom picture.</p> <p>Check leads, throttle-valve- switch plug for short to ground and short to positive.</p> <p>Attach EI-K control-unit plug.</p> <p>Attach throttle-valve-switch plug, push back sealing strip.</p> <p>Voltage, throttle-valve-switch plug (idle setting). Ignition ON.</p> <p>Fully open throttle valve.</p>	<p>1 2 2 3</p> <p>22 1 21 2 25 3</p> <p>1, 3</p> <p>1 2 (+) (-) 3 2 (+) (-)</p>	<p>see brief instruct. see brief instruct.</p> <p>approx. 0 Ω approx. 0 Ω approx. 0 Ω</p> <p>see brief instruct. see brief instruct.</p>	B27

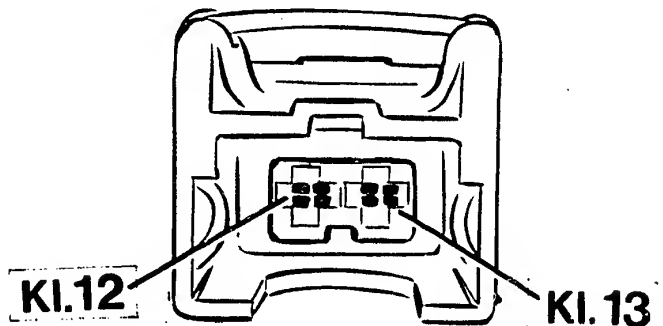


SELF-DIAGNOSIS TEST TABLE (CONTINUED)

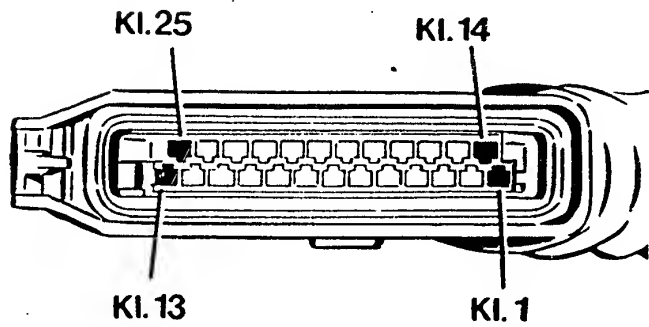
Fault indication Flashing code	Testing of component / function Test instructions/conditions	Term.	Set values	Coor- dinate
4	<p>KNOCK SENSOR</p> <p>Visual inspection (check knock-sensor plug and socket for oxidation and corrosion). See top picture.</p> <p>Detach EI-K control-unit plug. Resistance, EI-K control-unit plug and knock-sensor plug. See center and bottom picture.</p> <p>Check lead, knock-sensor plug for short to ground.</p> <p>Tightening torque.</p>	<p>12 12 13 13</p> <p>13</p>	<p>approx. 0 Ω approx. 0 Ω</p> <p>15...25 Nm</p>	C11
5	<p>EI-K CONTROL UNIT</p> <p>Renew EI-K control unit.</p>			—
6	<p>LOAD SIGNAL</p> <p>Connect resistance decade 120 Ω to throttle-valve-switch plug.</p> <p>Detach pressure hose, EI-K control unit.</p> <p>Connect Mityvac pump to EI-K control unit and build up pressure of approx. 300 mbar. Run engine for more than 10 seconds at equal to/greater than 4000 min⁻¹ and then allow to idle.</p> <p>Continued on next picture page</p>	<p>1 3</p>		C15



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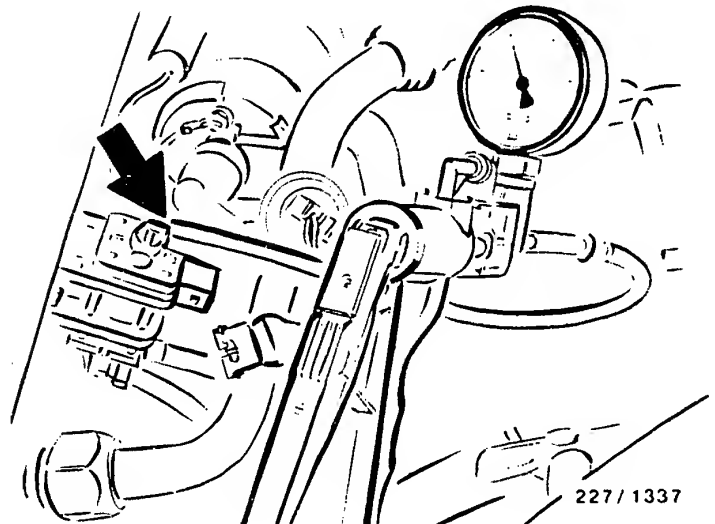
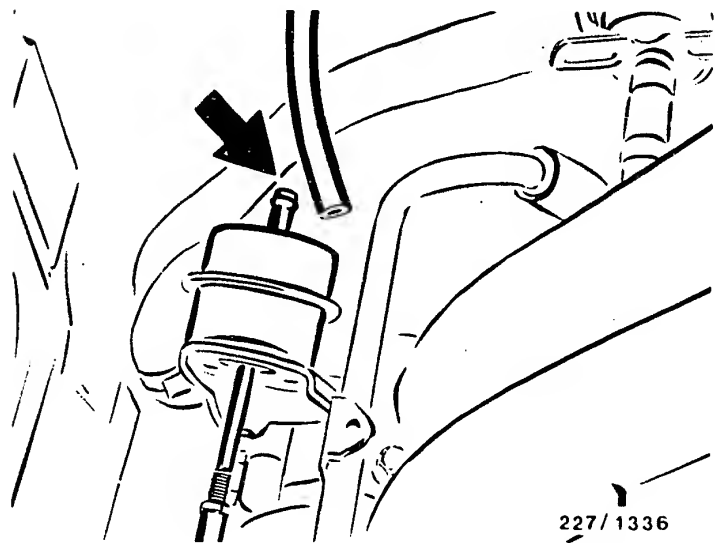
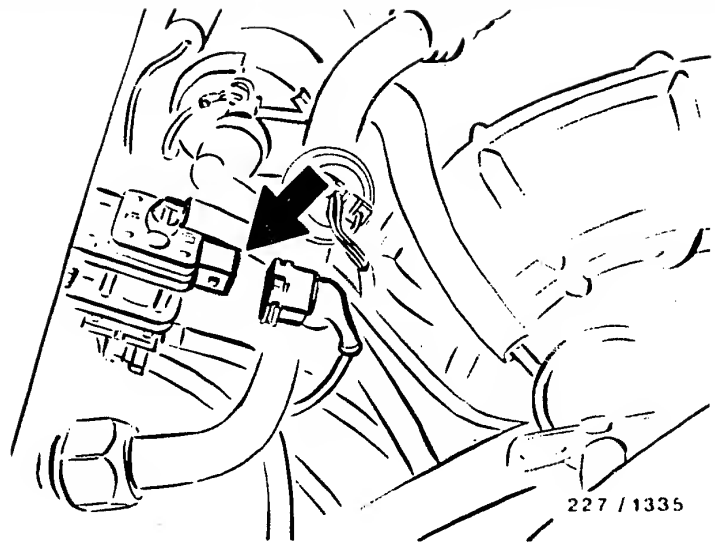
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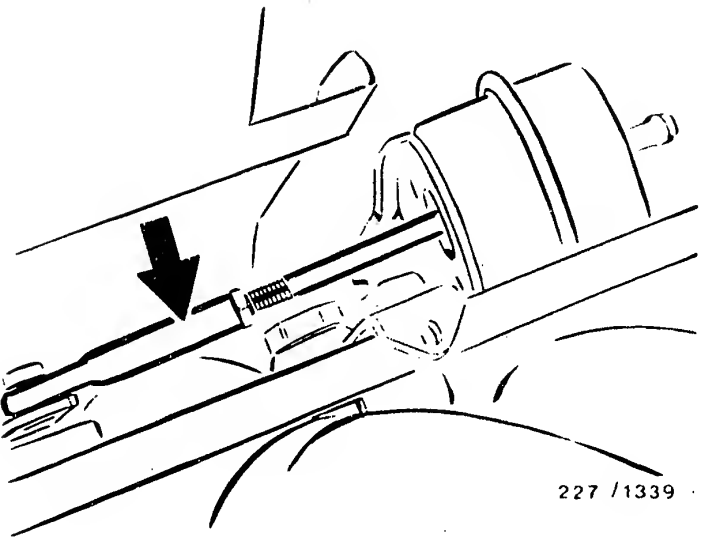
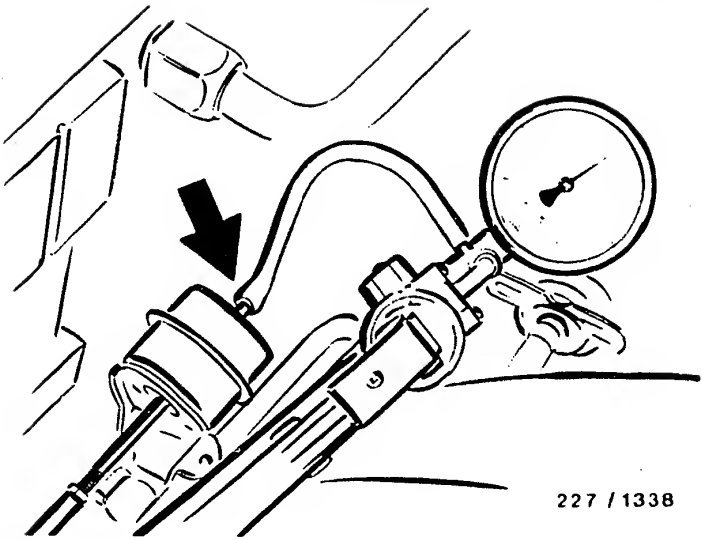
SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component / function Test instructions/conditions	Term.	Set values	Coor- dinate
6	<p>LOAD SIGNAL (continued)</p> <p>Read out flashing code. If flash- ing code 6 is no longer indicated, check pressure hose, EI-K control unit to intake manifold for leaks.</p> <p>Detach resistance decade from throttle-valve-switch plug. Attach pressure hose, EI-K control unit.</p> <p>Detach plug, charge-air-pressure frequency valve. See top picture, arrow. Perform test drive. In doing so, run engine for more than 10 seconds at equal to/greater than 4000 min⁻¹ and with fully depressed accelerator pedal. Allow engine to idle. Read out flashing code. If flashing code 6 is no longer indicated, check lead, EI-K control-unit plug for short to ground.</p> <p>Check hoses, charge-air-pressure regulation for leaks.</p> <p>Detach hose, diaphragm-type control valve. See center picture. Detach hose, charge-air-pressure frequency valve. Connect Mityvac pump to frequency valve. See bottom picture.</p> <p>Continued on next picture page</p>	1 3 15		C15



SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component / function Test instructions/conditions	Term.	Set values	Coor- dinate
6	<p>LOAD SIGNAL (continued)</p> <p>Actuate Mityvac pump (pressure end).</p> <p>Connect Mityvac pump to diaphragm-type control valve. See top picture, arrow.</p> <p>Build up pressure of 280...300 mbar with Mityvac pump.</p> <p>Note: Renew EI-K control unit if pushrod has moved.</p>		<p>No pressure indication</p> <p>Pushrod, diaphragm-type control valve must move (bottom picture, arrow)</p>	C15



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (1)

Flashing code 2

Check temperature sensor
(coolant)

Detach temperature-sensor
plug.
Connect ohmmeter to temperature
sensor (both connections) and
vehicle ground.
See top picture.

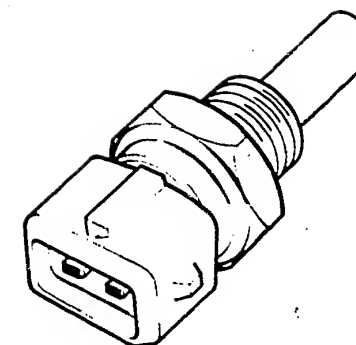
Set value: see brief instructions

Is set value attained?

N>

Check ground lead at intake
manifold for contact resistance.

Renew temperature sensor
if ground connection was O.K.



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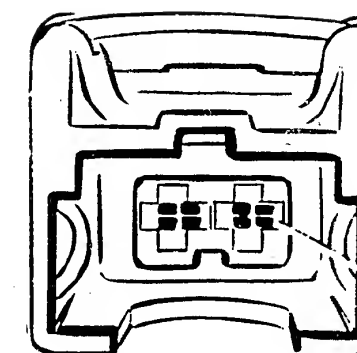
Visual inspection

Check temperature-sensor
plug for oxidation and
corrosion.
Contact spring damaged, en-
gaged?
See bottom picture.

Visual inspection O.K.?

N>

Eliminate faults.



KI. 2

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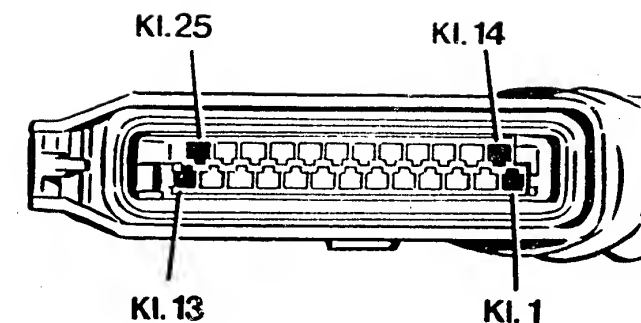
Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (1) CONTINUED (1)

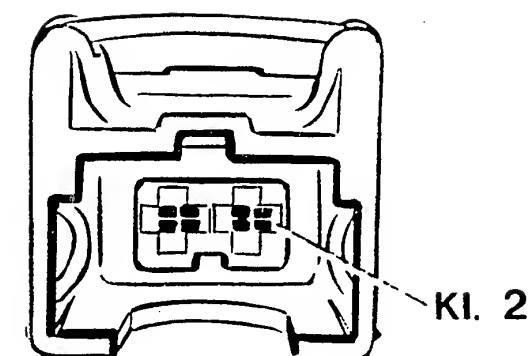
Detach EI-K control-unit plug
(top picture) and check lead
term. 2 to temperature-sensor
plug term. 2 (bottom picture)
for open circuit, short to
ground and short to positive.

Test O.K.?

Eliminate open circuit or
short to ground/positive.



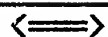
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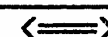
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Return to self-diagnosis
test table B13

B25



B26



SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (2)

V

Flashing code 3

Test throttle-valve switch (idle) with potentiometer (load pick-off voltage too small/large)..

Visual inspection, throttle valve.

Check throttle-valve housing for dirt.

See picture, arrow.

Note: dirt on throttle-valve housing is an indication of a clogged or damaged air filter.

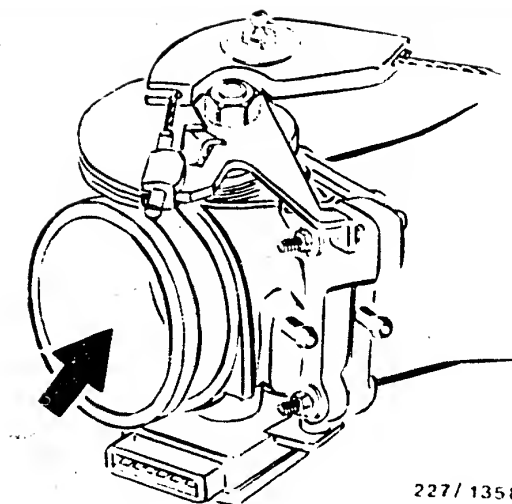
Visual inspection O.K.?

N>

Remove and clean throttle-valve housing (use new seal).

V

Continued on next picture page



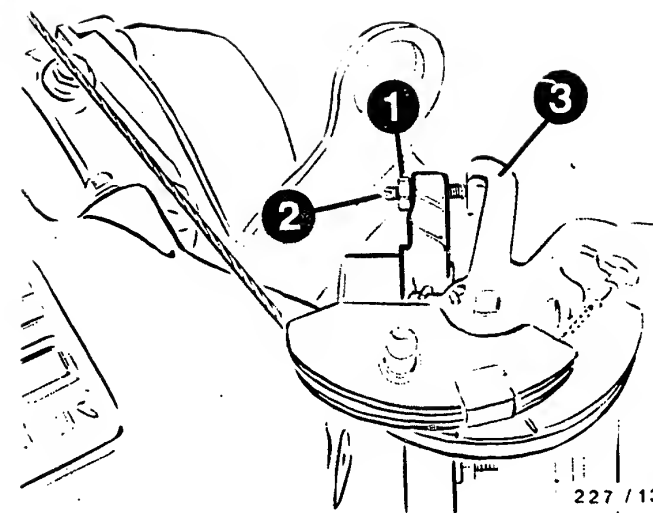
227/1358

Throttle-valve basic setting

Loosen lock nut, throttle-valve stop screw.
See picture.

Unscrew throttle-valve stop screw until throttle valve is completely closed.
Screw in stop screw until it makes contact with stop lever and then give a further 1/4 turn.
Tighten lock nut.

Basic setting performed?



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- 1 = Lock nut
- 2 = Throttle-valve stop screw
- 3 = Stop lever

Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (2) CONTINUED (2)

Throttle-valve-switch basic setting

Detach throttle-valve-switch plug.
Connect ohmmeter to throttle-valve switch term. 4 and term. 6.
See picture.

Throttle valve is in idle position.

Set value: approx. 0 Ω
(continuity)

Open throttle valve approx. 1°.

Set value: Ω
(open circuit)

Is set value attained?

N>

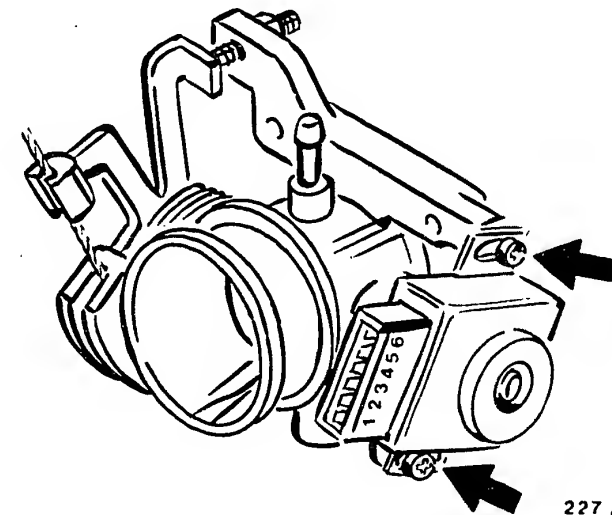
Loosen screws, throttle-valve switch.
See picture, arrow.

Turn throttle-valve switch in clockwise direction and then slowly in counter-clockwise direction until ohmmeter indicates approx. 0 Ω (microswitch clicks).

Secure throttle-valve switch.

C h e c k :
Open throttle valve approx. 1°.

Set value: Ω



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Continued on next picture page

Resistance, throttle-valve
potentiometer

N>

Renew throttle-valve switch (with
potentiometer).

Throttle-valve-switch plug
detached.

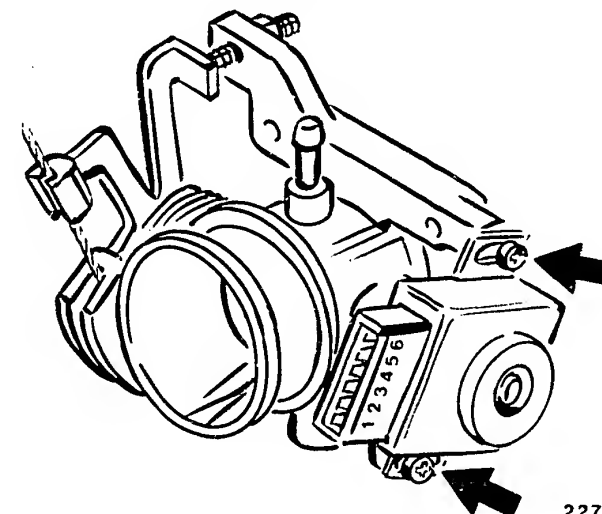
Connect ohmmeter to throttle-valve
potentiometer term. 1 and term. 2.
See picture.

Set value: see brief instructions

Connect ohmmeter to throttle-valve
potentiometer term. 2 and term. 3.

Set value: see brief instructions

Is set value attained?



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Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (2) CONTINUED (4)

Detach EI-K control-unit plug.
Throttle-valve-switch plug
detached.

Connect ohmmeter consecutively to:

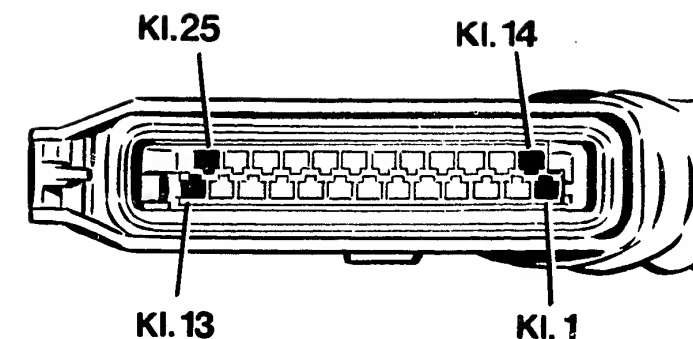
EI-K control- unit plug (top picture)	Throttle-valve- switch plug (bottom picture)
---	--

Term. 22	and	Term. 1
Term. 21	and	Term. 2
Term. 25	and	Term. 3

Set value: approx. 0 Ω in each
case

Is set value attained?

Eliminate open circuit.

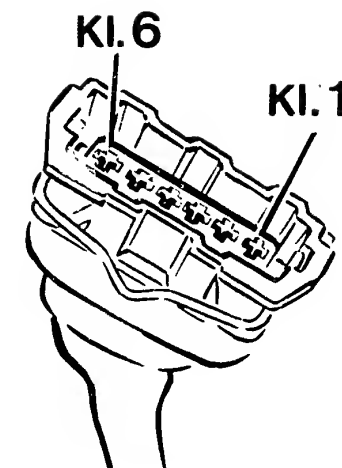


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Check leads from throttle-valve-
switch plug term. 1 and term. 3 to
EI-K control-unit plug term. 22 and
term. 25 for short to ground and
short to positive.

Leads O.K.?

Eliminate short to ground and short
to positive.



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Continued on next picture page

C07

<=>

C08

<=>

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (2) CONTINUED (5)

Attach EI-K control-unit plug.
Attach throttle-valve-switch plug,
push back sealing strip and connect
voltmeter to term. 1 (+)
and term. 2 (-).
See picture.
Ignition ON.

Set value: see brief instructions

Is set value attained?

N> Renew EI-K control unit.

Connect voltmeter to throttle-valve-
plug term. 3 (+) and term. 2 (-).
Throttle valve is in idle position.
Ignition ON.

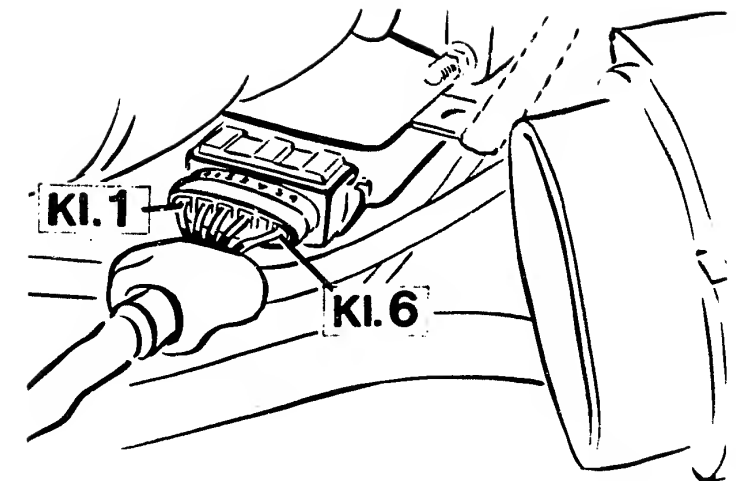
Set value: see brief instructions

Completely open throttle valve
(as far as stop):

Set value: see brief instructions

Is/are set value(s) attained?

N> Renew throttle-valve switch (with
potentiometer).



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Return to self-diagnosis
test table B15

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (3)

Flashing code 4

Test knock sensor

Visual inspection

Detach knock-sensor plug.

Check contacts of knock-sensor
plug and socket for oxidation and
corrosion.
See top picture.

Visual inspection O.K.?

Eliminate oxidation, corrosion.

Detach EI-K control-unit plug.

Connect ohmmeter consecutively to:

Knock-sensor
plug (center
picture)

EI-K control-unit
plug
(bottom picture)

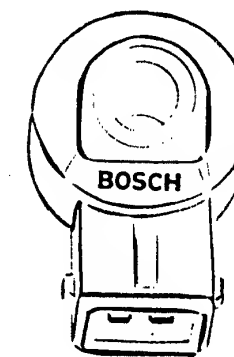
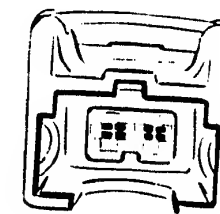
Term. 12 and
Term. 13 and

Term. 12
Term. 13

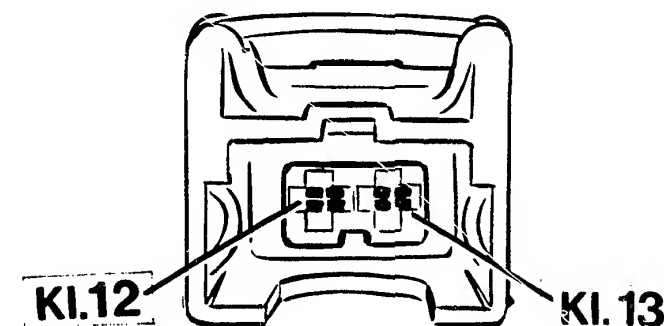
Set value: approx. 0 Ω
(continuity)

Is set value attained?

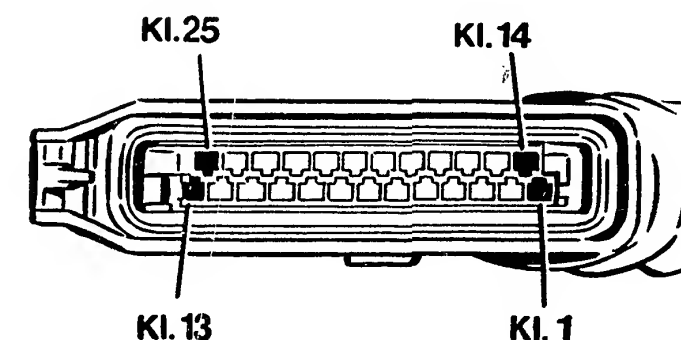
Eliminate open circuit.



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Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (3) CONTINUED (1)

Check lead from knock-sensor plug term. 13 to EI-K control-unit plug term. 13 for short to ground.
See top and center picture.

Lead O.K.?

Eliminate short to ground.

Check tightening torque of knock sensor.
See bottom picture, arrow.

Set value: 15...25 Nm

Is set value attained?

Tighten to prescribed torque.

Renew knock sensor.

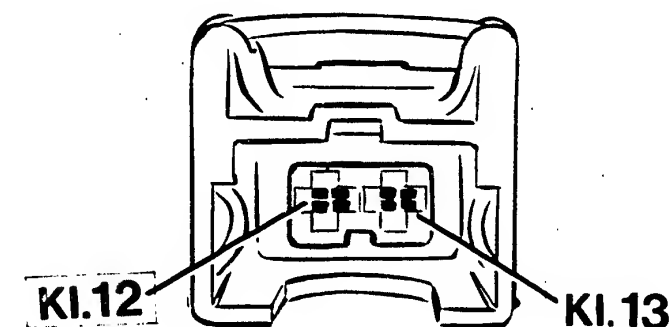
Activate self-diagnosis.

"Old" knock sensor is defective if flashing code 4 is now no longer indicated.

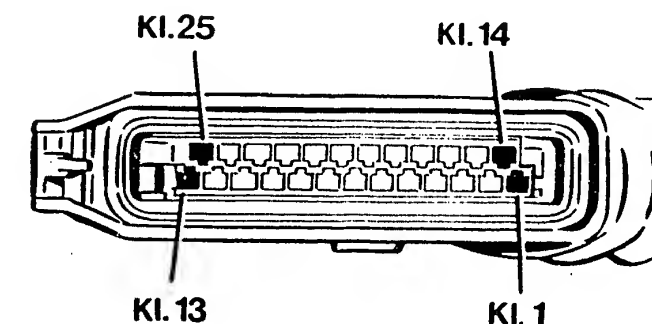
Self-diagnosis O.K.?

Install "old" knock sensor again and renew EI-K control unit (evaluation circuit defective).

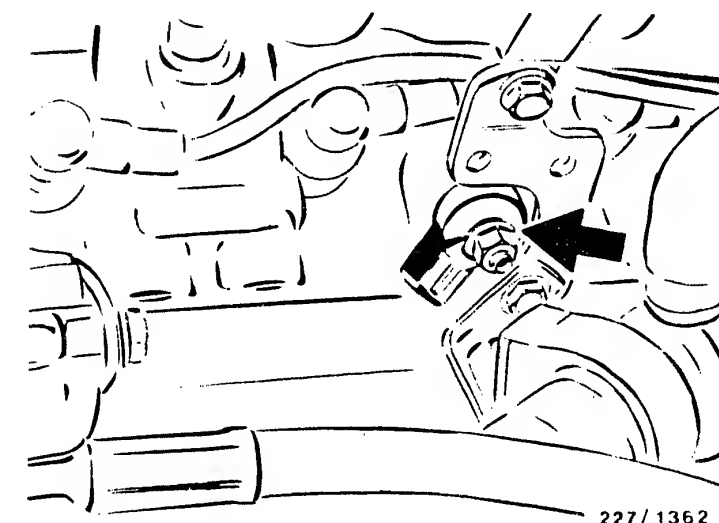
Return to self-diagnosis test table B17



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SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (4)

Flashing code 6

Check load signal

Ignition OFF.

Push back rubber sleeve at attached throttle-valve-switch plug and connect term. 1 and term. 3 to auxiliary lead and resistance decade.

See top picture.

Set resistance decade 120 Ω .

Detach pressure hose, EI-K control unit and connect Mityvac pump to EI-K control unit.
See center picture.

Use Mityvac pump to build up pressure of approx. 300 mbar.

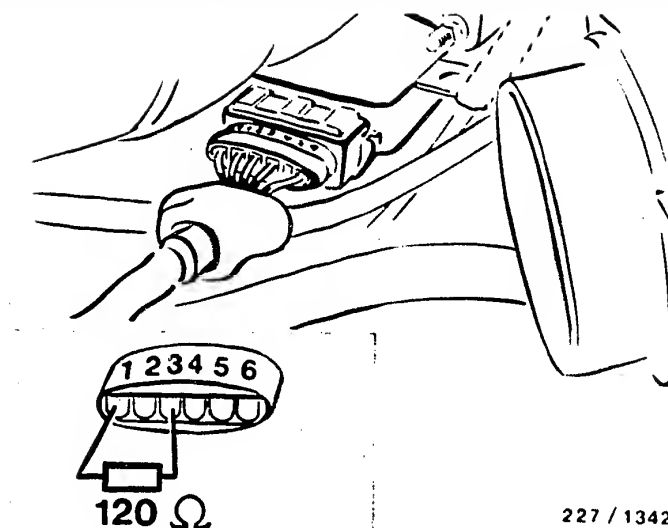
Run engine for more than 10 seconds at equal to/greater than 4000 min⁻¹ and then at idle.

Read out flashing code.

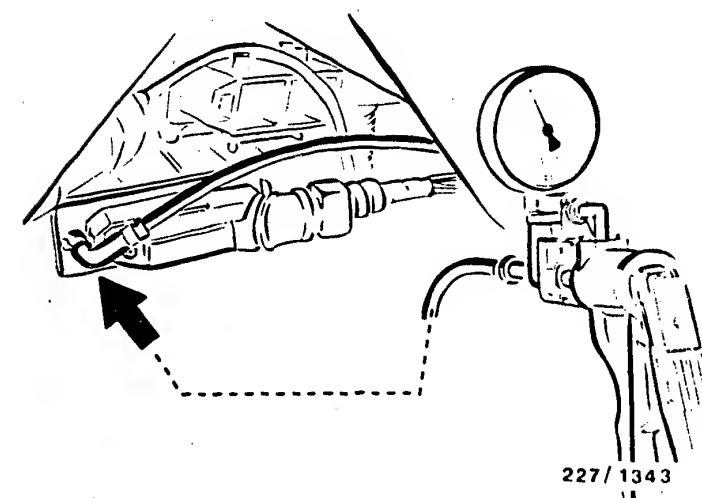
Is flashing code 6 indicated again?

N>

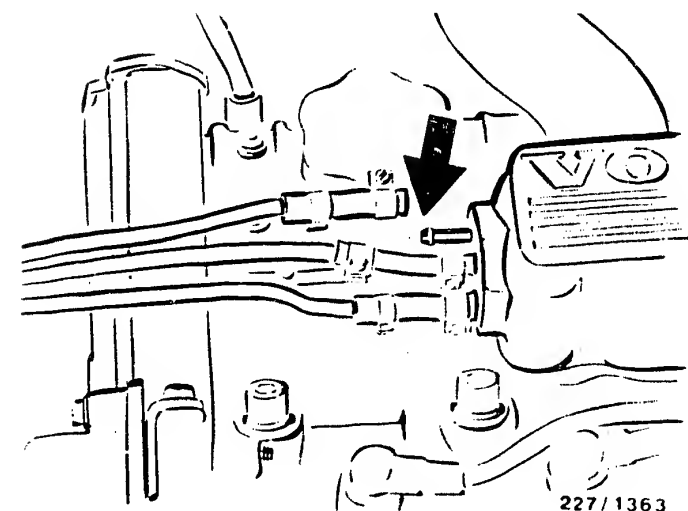
Check pressure hose from EI-K control unit (center picture, arrow) to intake manifold (bottom picture, arrow) for leaks.
Eliminate leak.



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Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (4) CONTINUED (1)

Ignition OFF.

Detach resistance decade from throttle-valve-switch plug term. 1 and term. 3.

Attach pressure hose, EI-K control unit.

Detach plug of charge-air-pressure frequency valve.
See top picture, arrow.

Perform test drive (road/dynamometer).

In doing so, run engine for more than 10 seconds at equal to/ greater than 4000 min⁻¹ and with accelerator pedal fully depressed. Allow engine to idle.

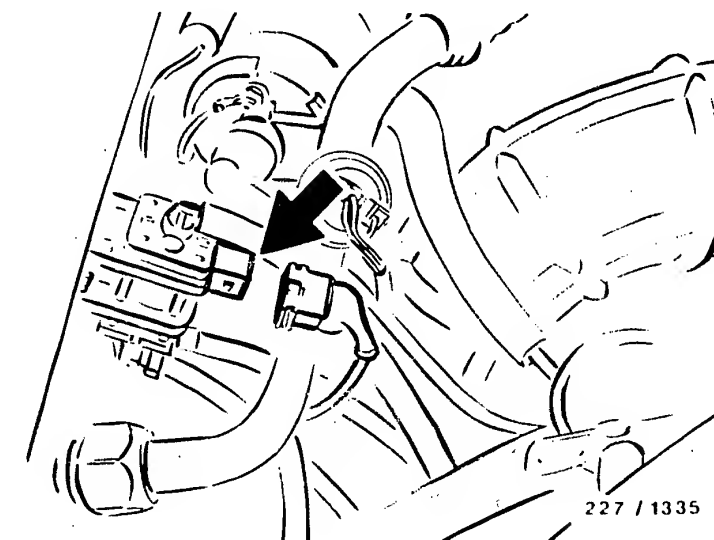
Read out flashing code.

Is flashing code 6 indicated again?

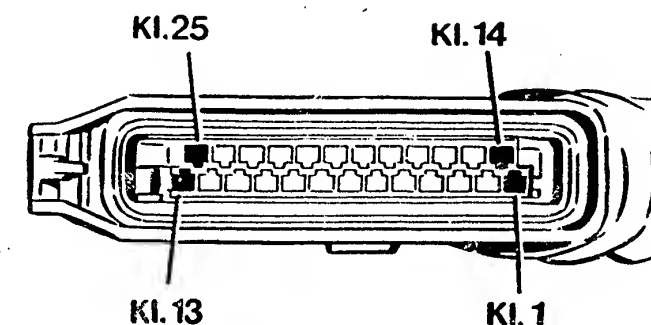
N>

Check lead from EI-K control-unit plug term. 15 (center picture) to charge-air-pressure frequency valve plug (bottom picture) term. (-) for short to ground.

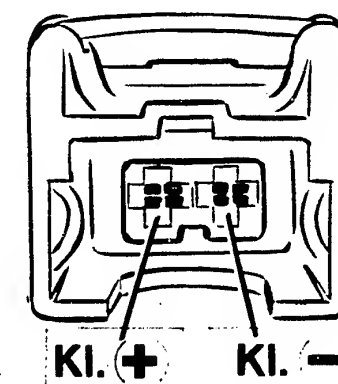
Eliminate short to ground.



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Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (4) CONTINUED (2)

V

Visual inspection

Check hoses of charge-air-pressure regulation for correct connection and leaks.
Refer to picture (highlighted in DIAGRAM OF AIR LINES).

Visual inspection and leakage
O.K.?

N>

Eliminate faults.

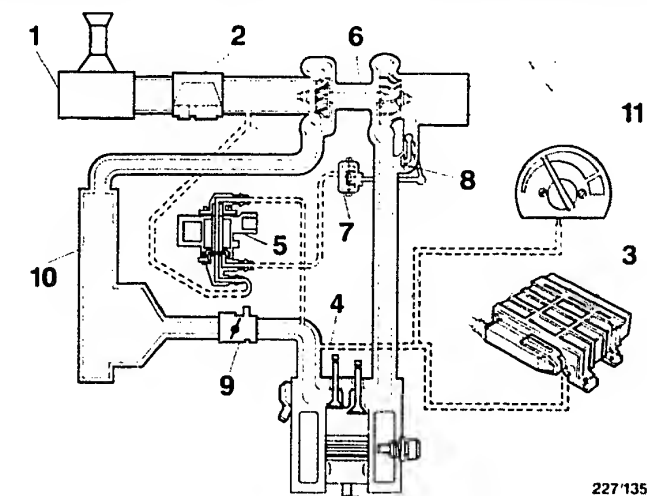
Y

Continued on next picture page

C19



C20



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SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (4) CONTINUED (3)

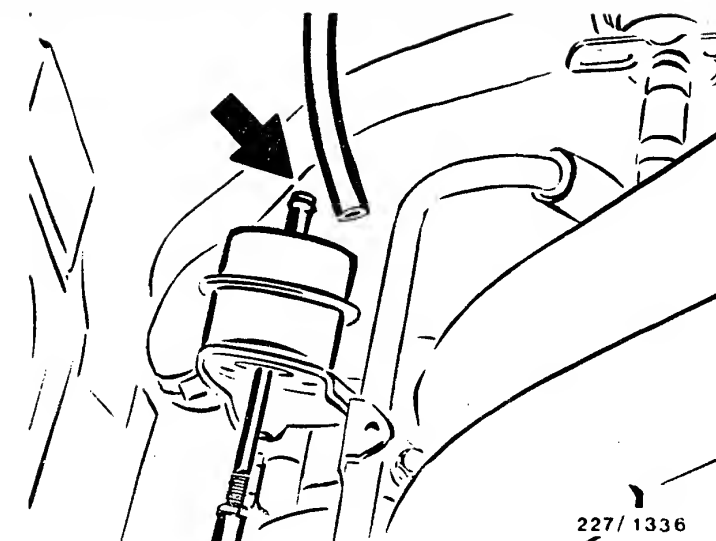
Detach hose of diaphragm-type control valve.
See top picture, arrow.

Detach hose at charge-air-pressure frequency valve and connect Mityvac pump to frequency valve.
See bottom picture, arrow.
Actuate Mityvac pump (pressure end).

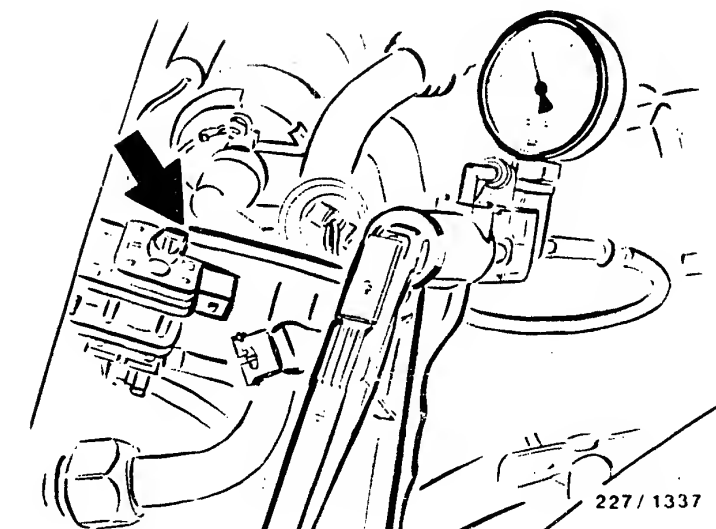
There must be no pressure indication (pressure build-up).
Note: short pressure peaks are not critical (pressure immediately decreases again).

Pressure indication O.K.?

N> Renew charge-air-pressure frequency valve



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Continued on next picture page

SELF-DIAGNOSIS TROUBLE-SHOOTING PROGRAM (4) CONTINUED (4)

Connect Mityvac pump to diaphragm-type control valve.

See top picture, arrow.

Use Mityvac pump to build up pressure of 280...300 mbar.

The pushrod must move as of approx. 280 mbar pressure.

See bottom picture, arrow.

Has pushrod moved?

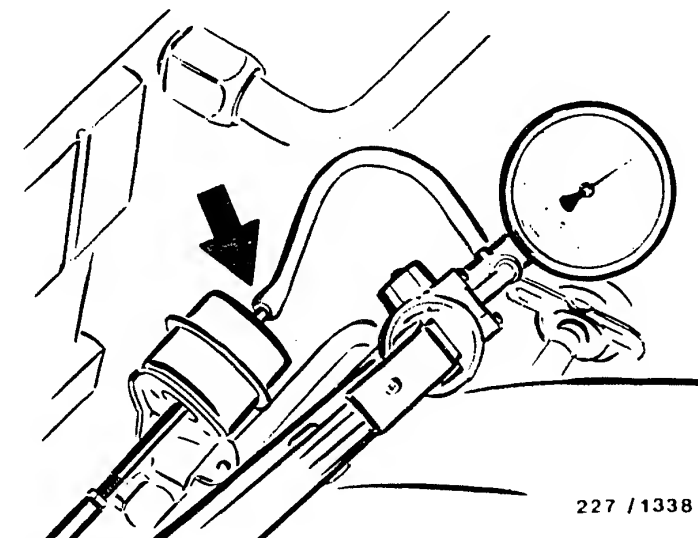
N>

Diaphragm-type control valve defective or turbo-supercharger relief valve does not move freely or charge-air pressure (pushrod, sleeve) incorrectly set.

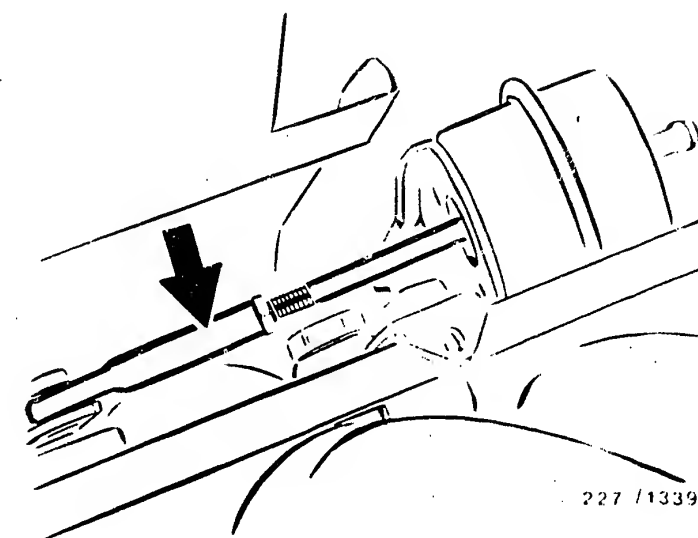
Eliminate defects.

Renew EI-K control unit.

Return to self-diagnosis test table B17



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TROUBLE-SHOOTING PROGRAM (1)

↓

Test high-voltage side.

N>

Repair high-voltage side.

Test spark plugs, spark-plug connectors, suppression resistors, H.T. ignition cables, distributor cap, distributor rotor etc. for proper operation (e.g. open circuit, shunt).

Assessment e.g. through ignition oscillogram, resistance measurements and visual check.

High-voltage side O.K.?

Y

↓

Return to trouble-shooting chart B03

C25

⇒

C26

⇐⇒

TROUBLE-SHOOTING PROGRAM (2)

Check ignition coil

Visual examination:

Remove protective cap from ignition coil and check whether plug is in position and whether sealing compound has escaped.
See picture.

Electrical check:

Ignition coil primary term. 15 and term. 1

(Take resistance of test lead and test prods into account)

Set value: see brief instructions

Ignition coil secondary term. 1 and term. 4

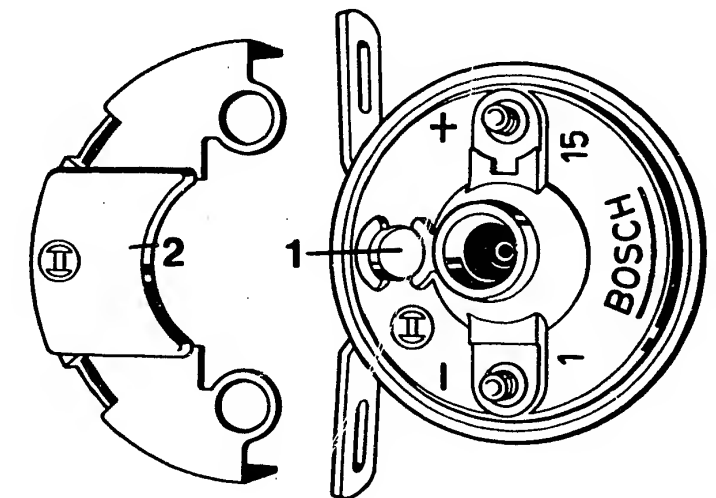
Set value: see brief instructions

Visual examination O.K./set value obtained?

N>

1. If there is no plug or if sealing compound has oozed out, renew EI-K control unit, as well as trigger box and ignition coil.

2. If set values are not O.K., renew ignition coil.



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1 = Plug
2 = Protective cap

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (3)

V

Check voltage to trigger box.

Disconnect trigger-box plug
and connect voltmeter to term. 3
(+) and term. 2 (-).
See picture.

Switch on ignition.

Set value: battery voltage

Set value obtained?

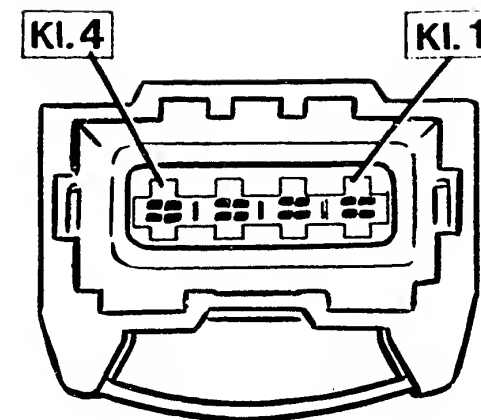
N>

Check for open circuit in leads
and connections between ignition/
starting switch and trigger-box
plug term. 3 including ground
lead term. 2.

Eliminate open circuit.

V

Return to trouble-shooting chart
B03



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D01

<=>

D02

<=>

TROUBLE-SHOOTING PROGRAM (4)

V

Test primary circuit.

Detach trigger-box plug.
Connect ohmmeter to trigger box
term. 3 and ignition coil term. 15.
See picture.

Set value: approx. 0 Ω
(continuity)

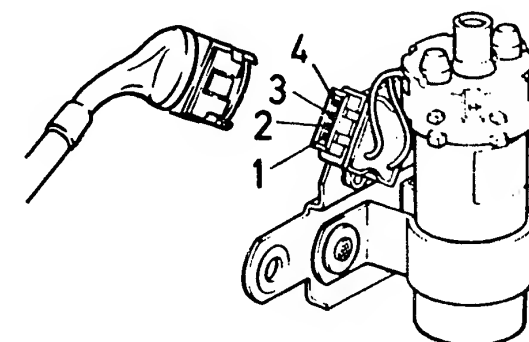
Is set value attained?

Renew trigger box.

N>

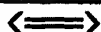
V

Return to trouble-shooting chart
B03



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D03



D04



TROUBLE-SHOOTING PROGRAM (5)

V

Check voltage, EI-K control unit.

Detach EI-K control-unit plug and connect voltmeter consecutively to term. 6 and 5 (+) as well as term. 14 and 20 (-).

See picture.

Ignition ON.

Set value: battery voltage

Is set value attained?

N>

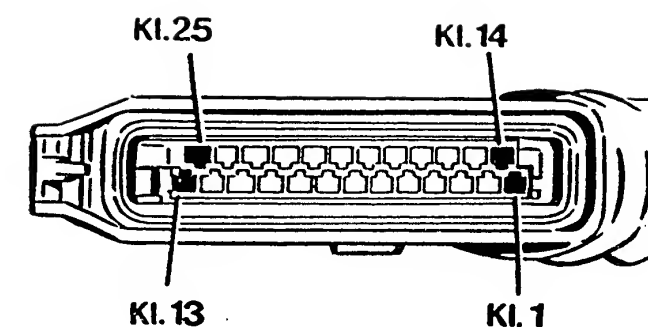
Check leads and connections from ignition/starting switch to EI-K control-unit plug term. 6 and 5 including ground lead term. 14 and 20 for open circuit.

Eliminate open circuit.

Y

V

Return to trouble-shooting chart B03



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D05

<=>

D06

<=>

TROUBLE-SHOOTING PROGRAM (6)

Check insulation of engine-speed and reference-mark sensor.

Disconnect EI-K control-unit plug and connect ohmmeter to term.23 and term.11 .
See top picture.

Set value: infinity Ω

Set value obtained?

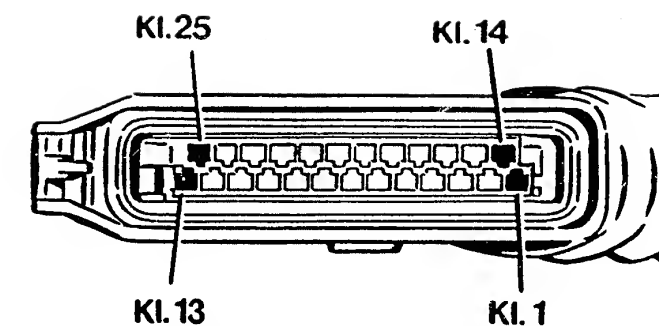
N>

Take apart plug connector of engine-speed and reference-mark sensor.

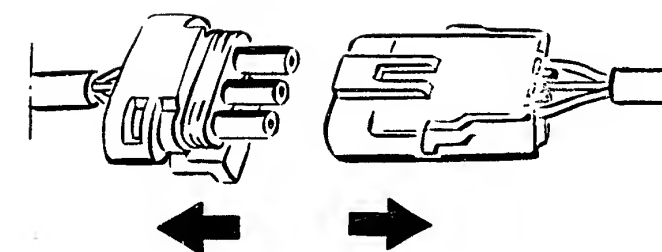
See bottom picture, arrow.

If set value now obtained, replace engine-speed and reference-mark sensor.

If set value not obtained, eliminate short circuit to ground between plug connector and EI-K control-unit plug.



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Return to trouble-shooting chart B03

D07

<=>

D08

<=>

TROUBLE-SHOOTING PROGRAM (7)

Check internal resistance of engine-speed and reference-mark sensor.

Disconnect EI-K control-unit plug and connect ohmmeter to term. 10 and term. 23. See top picture.

Set value: See brief instructions.

Set value obtained?

N>

Take apart plug connector of engine-speed and reference-mark sensor. See center picture, arrow.

Connect ohmmeter to:

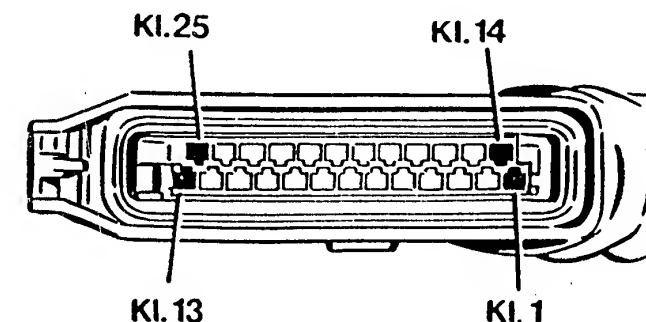
EI-K control-unit plug	Plug connector
Term. 23 and Term. 23	
Term. 10 and Term. 10	
Term. 11 and Term. 11	

Term. 23	and	Term. 23
Term. 10	and	Term. 10
Term. 11	and	Term. 11

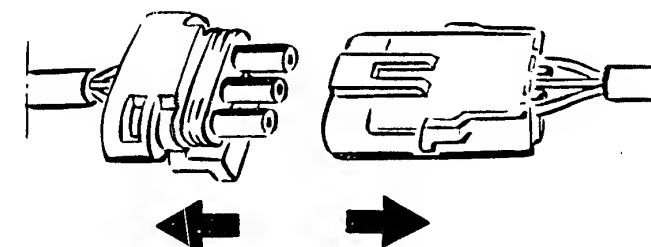
Set value: Approx. 0 Ω in each case (continuity)

Eliminate open circuit.

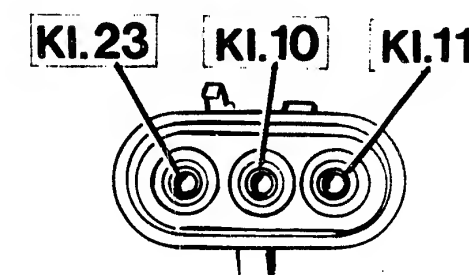
If there was no open circuit, replace engine-speed and reference-mark sensor.



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227 / 1365



227 / 1366

Return to trouble-shooting chart B03

D09

<=>

D10

<=>

TROUBLE-SHOOTING PROGRAM (8)

Check voltage at engine-speed and reference-mark sensor.

Disconnect EI-K control-unit plug.

Connect oscilloscope according to operating instructions with program switch in "special" position.

For example MOT 206:

Connect red and black clamps to EI-K control-unit plug term. 23 (+) and term. 10 (-). See top picture.

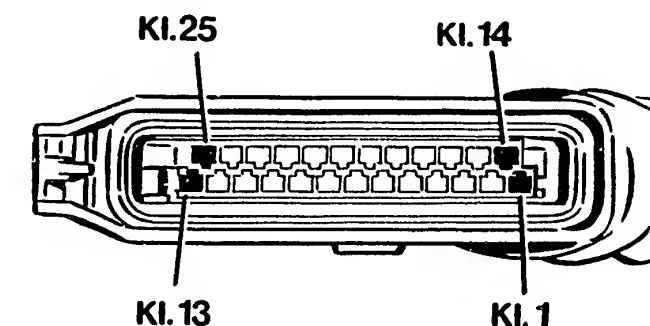
Start engine.

Oscilloscope must indicate an engine-speed-signal voltage. See bottom picture.

Set value: at least 1,5 V

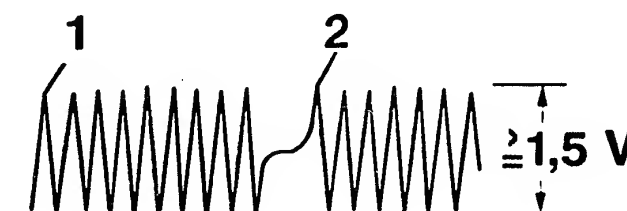
Set value obtained?

Replace engine-speed and reference-mark sensor.



227 / 321

1 = Engine-speed signal
2 = Reference-mark signal



227/1341

Return to trouble-shooting chart B03

D11

<=>

D12

<=>

TROUBLE-SHOOTING PROGRAM (9)

Test EI-K control-unit function.

Trigger-box and EI-K control-unit plug attached.

Push back rubber sleeve of trigger-box plug.

Connect oscilloscope in program-selector-switch setting "special" in accordance with operating instructions.

For example MOT 206:

Red clip to trigger-box plug term. 4 (measurement signal).
See top picture.

Black clip to vehicle ground.

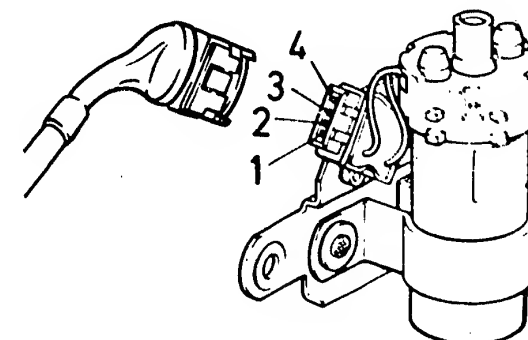
Start engine.

Oscilloscope must indicate rectangular pulse of at least 2,5 V.
See bottom picture.

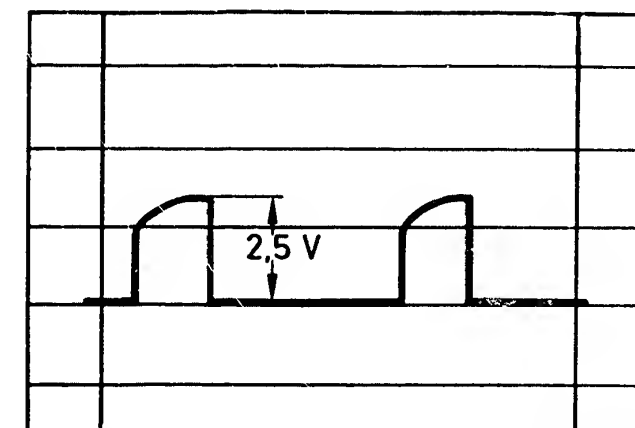
Note: The important factor is the minimum voltage and not the profile (edges may be smooth).

Rectangular pulse present?

Detach trigger-box and EI-K control-unit plug.



227 1340



227/1224

Return to trouble-shooting chart B03

Continued on next picture page

Connect ohmmeter consecutively to:

EI-K control- unit plug (top picture)	Trigger-box plug (bottom picture)
---	---

Term. 16 and term. 4

Set value: approx. 0 Ω
(continuity)

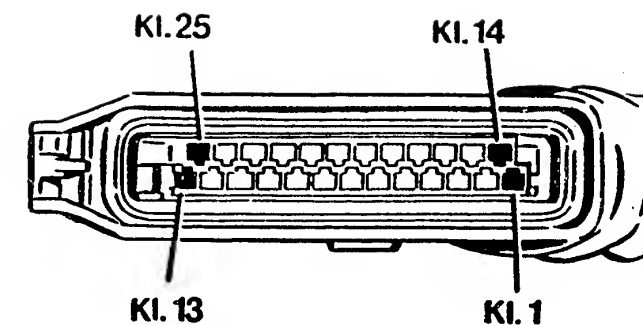
Eliminate open circuit.

Trigger-box plug	Trigger-box plug
---------------------	---------------------

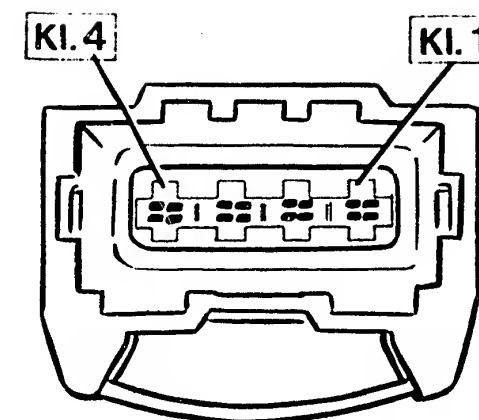
Term. 4 and term. 2

Set value: infinity Ω
(open circuit)

Eliminate short to ground.



227 / 321



227 / 1082

Continued on next picture page

Attach EI-K control-unit plug.

Connect resistor between 240 and 270 Ω at detached trigger-box plug term. 4 and term. 2.
See top picture.

Oscilloscope "special" with red clip to trigger-box plug term. 4 (+).
See top picture.
Black clip to vehicle ground.

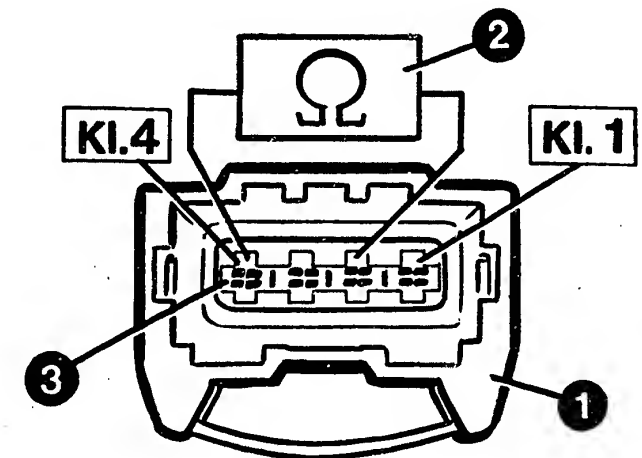
Start engine.

Oscilloscope must indicate a rectangular pulse of at least 2,5 V.
See bottom picture.

Note: The important factor is the minimum voltage and not the profile (edges may be smooth).

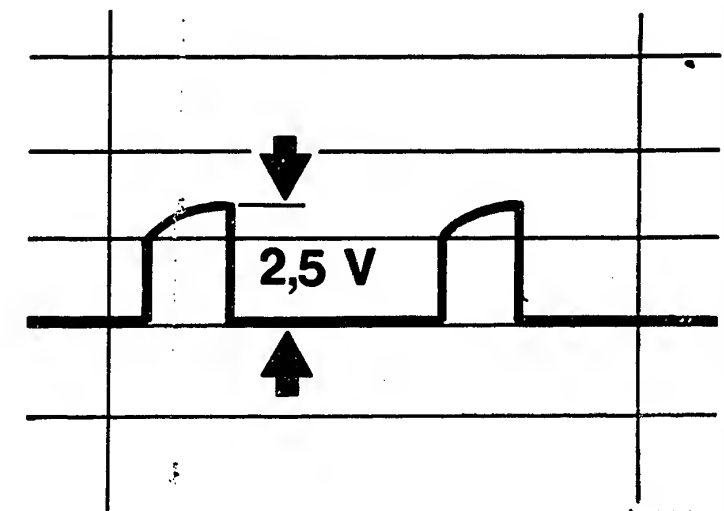
If set value is attained, renew trigger box.

If set value was not attained, renew EI-K control unit.



227 / 1241

- 1 = Trigger-box plug
- 2 = Resistor 240...270 Ω
- 3 = to oscilloscope



227 / 1224

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (10)

Check contact resistance
(primary side).

Disconnect negative and positive
leads from battery.

Disconnect trigger-box plug.
See picture.

Switch on ignition.

Check for contact resistance
in leads between positive
battery terminal and trigger-
box plug term. 3 including
leads between negative battery
terminal and trigger-box plug
term. 2.

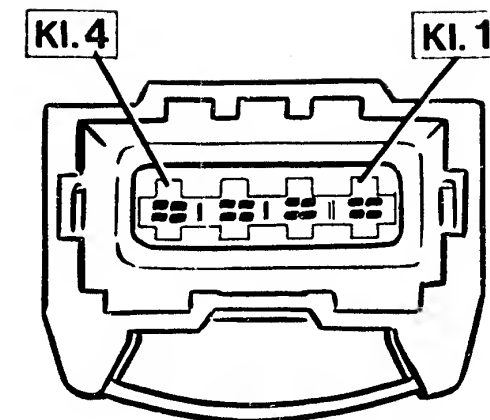
(Take resistance of test lead/
test prods into account.)

Set value: see brief instructions

Set value obtained?

N>

Eliminate contact resistance.



227/1082

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (11)

Test engine-speed signal.

Negative and positive lead of battery connected.
Trigger-box plug connected.

Detach LH-Jetronic control-unit plug.
See top picture.

Connect oscilloscope in program-selector-switch setting "special" in accordance with operating instructions.

For example MOT 206:

Red clip to LH-Jetronic control-unit plug term. 1
(measurement signal).
See top picture.

Black clip to vehicle ground.

Start engine.

Oscilloscope must indicate a rectangular pulse.

See bottom picture.

Rectangular pulse present?

N>

Detach EI-K control-unit plug.
See top picture.

Connect ohmmeter consecutively to:

EI-K control-unit plug	LH-Jetronic control-unit plug (top picture)
------------------------	--

Term. 17 and term. 1

Set value: approx. 0 Ω
(continuity)

Eliminate open circuit.

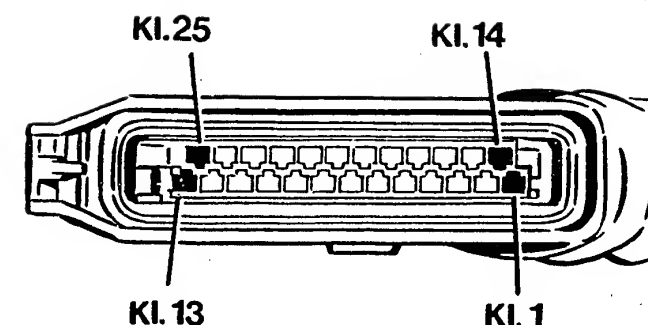
LH-Jetronic control-unit plug	LH-Jetronic control-unit plug
-------------------------------	-------------------------------

Term. 1 and term. 5

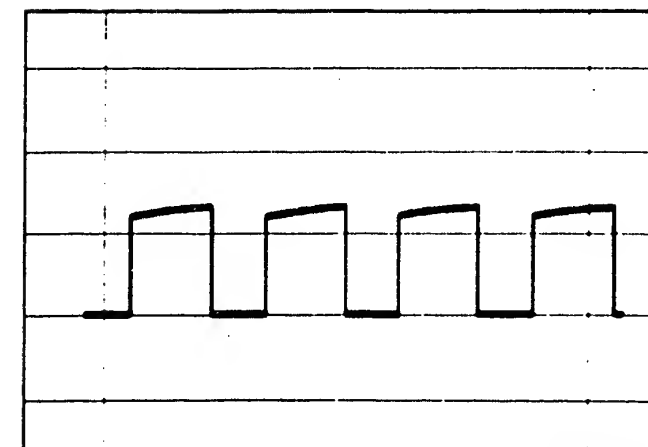
Set value: infinity Ω
(open circuit)

Eliminate short to ground.

Renew EI-K control unit if there was no open circuit or short to ground.



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227IC096

Return to trouble-shooting chart
B03

D21

<=>

D22

<=>

TROUBLE-SHOOTING PROGRAM (12)

V

Test primary signal.

EI-K control-unit and trigger-box
plug attached.

Primary signal with oscilloscope

Connect oscilloscope in accordance
with operating instructions to
ignition coil term. 15 (+) and
term. 1 (-).

Start engine.

Set value:
Oscilloscope must indicate a primary
voltage (magnitude irrelevant).
See picture.

O R

Primary signal with engine-speed
tester

Connect engine-speed tester in
accordance with operating instruc-
tions to ignition coil term. 15 (+)
and term. 1 (-).

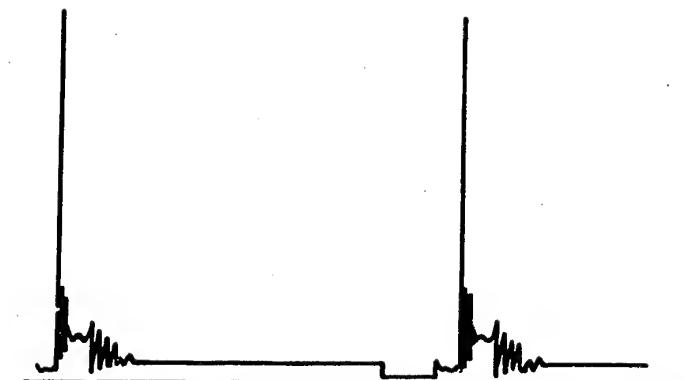
Start engine.

Set value:
Engine-speed tester must indicate
a value (magnitude irrelevant).

Primary signal present?

N>

Renew trigger box.



227/1100

V

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (13)

V

Check throttle-valve switch (idle)

Throttle-valve visual inspection

Check throttle-valve housing for dirt.

See picture, arrow.

Note: dirt on throttle-valve housing is an indication of clogged or damaged air filter.

Visual inspection O.K.?

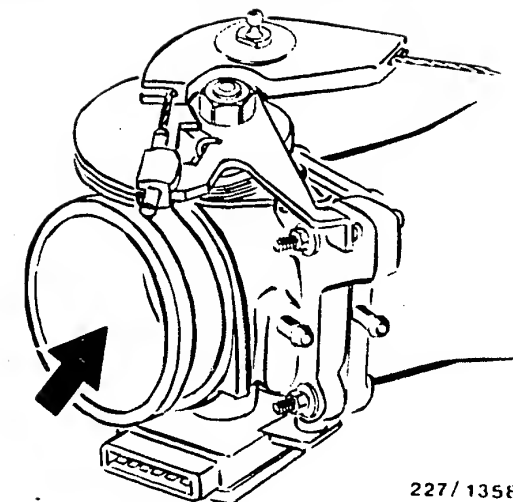
N>

Remove and clean throttle-valve housing (use new seal).

Y

V

Continued on next picture page



227/1358

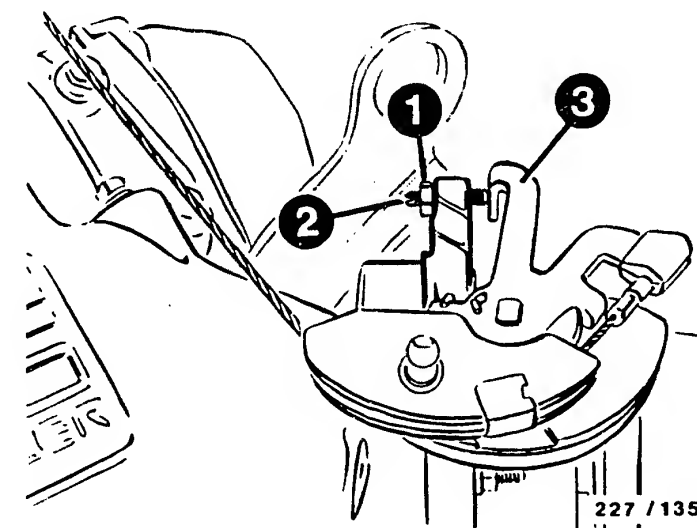
Throttle-valve basic setting

Loosen lock nut, throttle-valve stop screw.
See picture.

Unscrew throttle-valve stop screw until throttle valve is completely closed.

Screw in stop screw until it makes contact with stop lever and then give a further 1/4 turn.
Tighten lock nut.

Basic setting performed?



- 1 = Lock nut
2 = Throttle-valve stop screw
3 = Stop lever

Continued on next picture page

Check throttle-valve-switch (idle) basic setting

Detach LH-Jetronic control-unit plug.
See top picture.

Detach EI-K control-unit plug and connect ohmmeter to term. 7 and term. 14.
See top picture.

Throttle valve is in idle position.

Set value: approx. 0 Ω
(continuity)

Open throttle valve approx. 1°.

Set value: infinity Ω
(open circuit)

Is set value attained?

N>

1. Check lead from EI-K control-unit plug term. 7 to throttle-valve-switch plug term. 4 or from term. 6 to vehicle ground for open circuit.
Eliminate open circuit.

2. Loosen screws, throttle-valve switch.
See bottom picture, arrow.

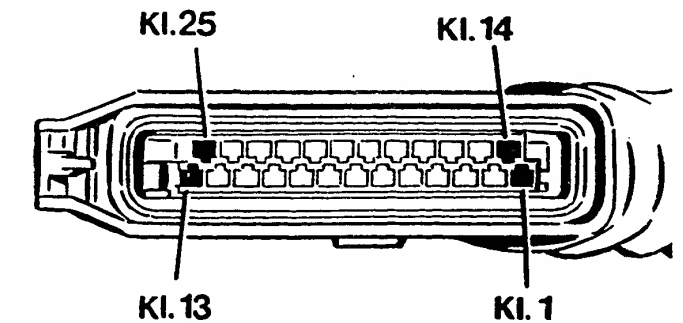
Turn throttle-valve switch in clockwise direction and then slowly in counter-clockwise direction until ohmmeter indicates approx. 0 Ω (microswitch clicks).

Secure throttle-valve switch.

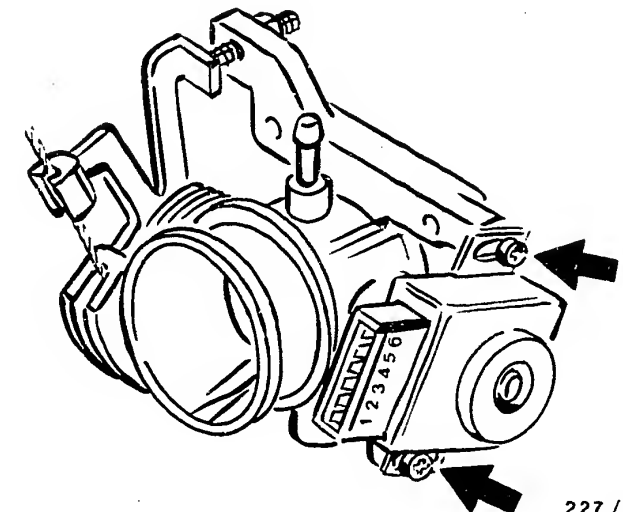
C h e c k:
Open throttle valve approx. 1°.

Set value: infinity Ω

If set values for test steps 1 and 2 are not attained, renew throttle-valve switch.



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227 / 1360

Return to trouble-shooting chart
B03

TROUBLE-SHOOTING PROGRAM (14)

Check full-load signal

Detach LH-Jetronic control-unit plug and push back handle cover after unscrewing fastening screws and removing sealing strip. See top picture.

Attach LH-Jetronic control-unit plug and connect voltmeter to term. 12 (+) and vehicle ground.

Push back rubber sleeve at attached throttle-valve-switch plug and connect term. 1 and term. 3 to auxiliary lead and resistance decade. See center picture.
Set resistance decade to 120 Ω .

Detach pressure hose, EI-K control unit and connect Mityvac pump to EI-K control unit. Bottom picture.

Use Mityvac pump to build up pressure of 200 mbar.

Run engine at 2500...3000 min⁻¹ (idle switch open).

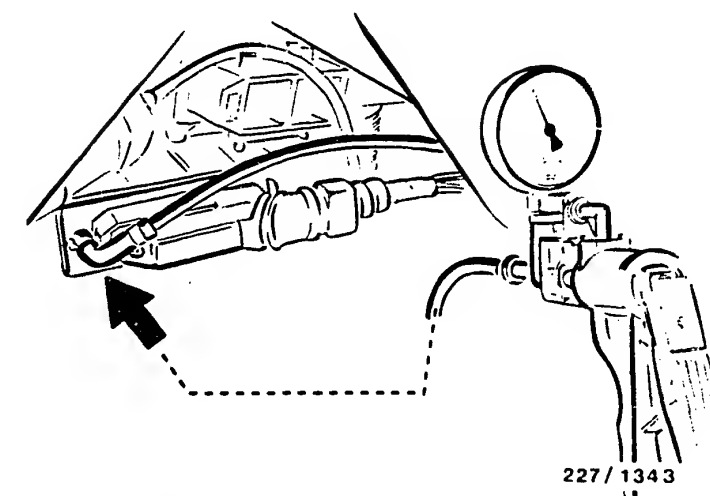
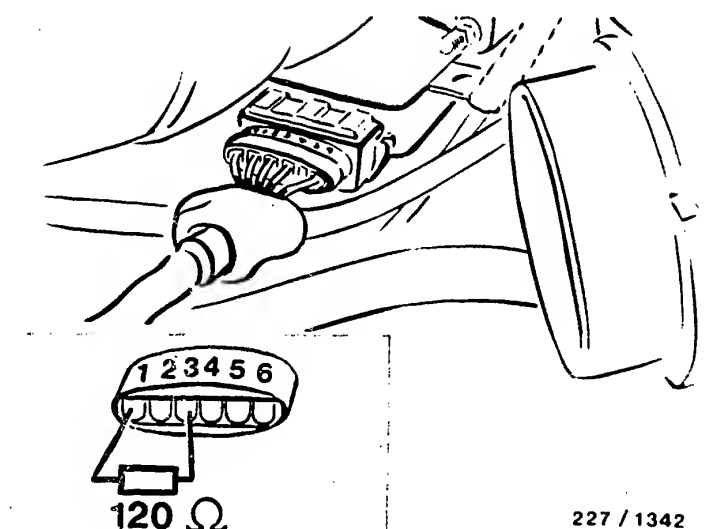
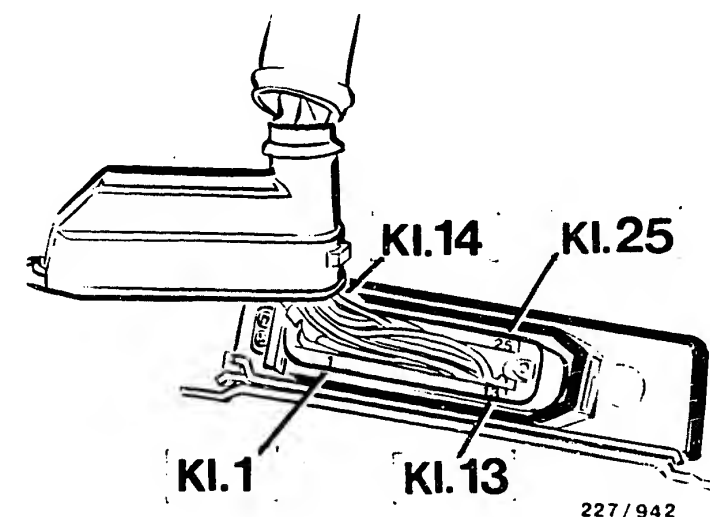
Set value: 0.2...1.0 V

Is set value attained?

N>

Check lead, LH-Jetronic control-unit plug term. 12 for open circuit, short to ground and short to positive. Eliminate fault.

Renew EI-K control unit if there was no fault.



Return to trouble-shooting chart B03

TROUBLE-SHOOTING PROGRAM (15)

Check charge-air-pressure frequency valve

Detach pressure hose, EI-K control unit and connect pressure gauge or Mityvac pump (pressure) to EI-K control unit.

Perform test drive (road/dynamometer).

In doing so, run engine at equal to/greater than 4500 min^{-1} and with accelerator pedal fully depressed.

Set value: charge-air pressure equal to/greater than 450 mbar

Is set value attained?

N>

Throttle-valve-switch plug
Push back rubber sleeve and connect term. 1 and term. 3 to auxiliary lead and resistance decade.

See top picture.

Set resistance decade to 120Ω .

Connect up dwell-angle tester in accordance with operating instructions. For example:

Yellow clip to detached frequency-valve plug term. (+).

Green clip to term. (-).

See center picture.

Detach pressure hose, EI-K control unit and connect Mityvac pump to EI-K control unit. See bottom picture.

Use Mityvac pump to build up pressure of approx. 300 mbar.

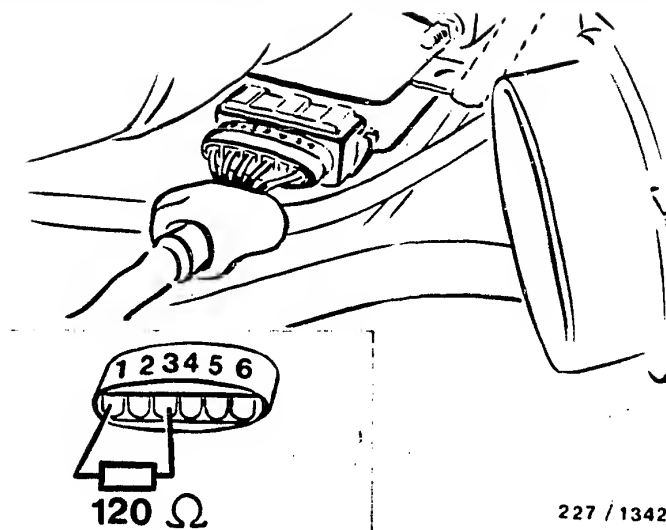
Run engine at approx. 4000 min^{-1} .

Set value: equal to/greater than 35 %

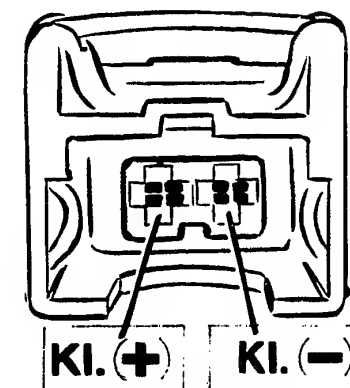
If set value is not attained, check lead of frequency-valve plug term. (+), winding of frequency valve (approx. 30Ω) and lead from frequency-valve plug term. (-) to EI-K control-unit plug term. 15 for open circuit. Eliminate open circuit.

Renew EI-K control unit if there was no open circuit.

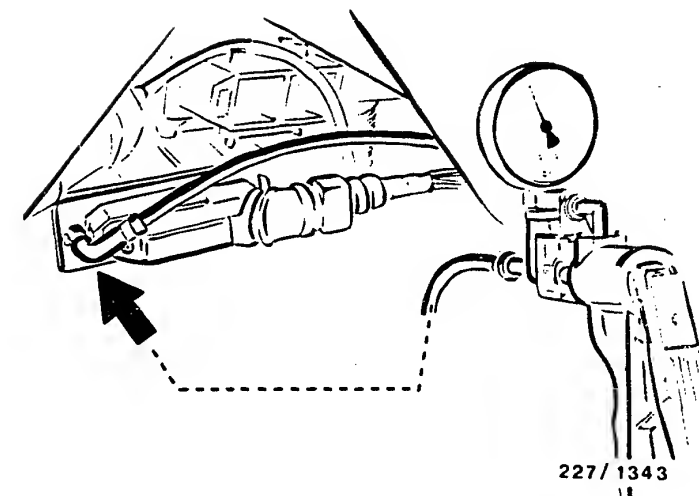
Return to trouble-shooting chart B04



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227 / 1364



227 / 1343

TROUBLE-SHOOTING PROGRAM (16)

Test trigger-box voltage.

Trigger-box plug connected.

Push back rubber sleeve of trigger-box plug and connect voltmeter to term. 3 (+) and term. 2 (-).
See top picture.

Allow engine to idle.

Set value: 12..14 V or max. 1 V below battery voltage.

Is set value attained?

N>

Disconnect negative and positive lead of battery.

Detach trigger-box plug.
See bottom picture.

Switch on ignition.

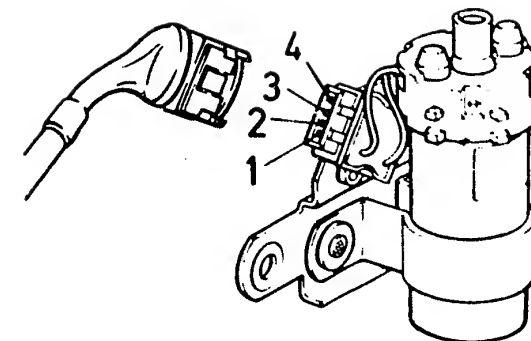
Test following leads for contact resistance:

1. From battery negative terminal to trigger-box plug term. 2

2. From battery positive terminal to trigger-box plug term. 3

Contact resistance when testing items 1 and 2
max. 0.3 Ω
(take account of resistance of test lead/test prods).

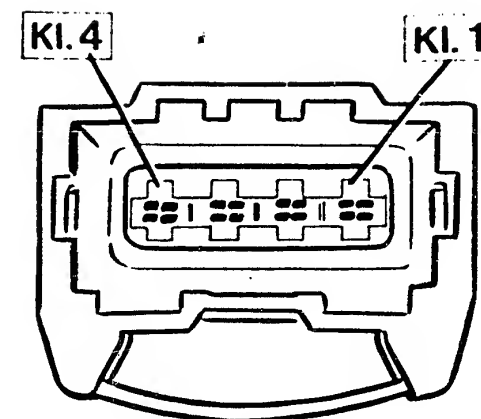
Eliminate contact resistances.



227 1440

Y

Return to trouble-shooting chart B04



227/1082

E07

<=>

E08

<=>

TROUBLE-SHOOTING PROGRAM (17)

V

Test ignition-coil voltage.

Connect voltmeter to ignition coil term. 15 (+) and battery negative terminal.

Allow engine to idle.

Set value: at least 10 V

Is set value attained?

N>

Detach positive lead of battery.

Switch on ignition.

Test for contact resistance in leads from battery positive terminal to ignition coil term. 15.

(Take account of resistance of test lead/test prods.)

Set value: max. 0,3 Ω

Eliminate contact resistance.

Y

Return to trouble-shooting chart
B04

E09

<==>

E10

<==

DANGER OF ACCIDENT ON SEMI-
CONDUCTOR IGNITION SYSTEMS

|22|
VDT-I-227/102 En
03.1981

Supersedes Feb. 3, 1976 edition

Please be sure to pass this bulletin
together with VDE 0104/7.67 enclosed on to your
employees for their attention.

The increased demands made on their ignition
systems by modern engines, and the wish for freedom
from maintenance, led some time ago to manufacturers
starting to equip their vehicles with semi-conductor
ignition systems as original equipment.

In most cases, the performance of nearly all
makes of such systems is higher than that of
conventional systems, and further improvements are
to be expected. This means that semi-conductor
ignition systems have reached the point where
contact with "live" components or terminals
(whether on the primary side or the secondary side)
can prove fatal.

In this connection, we should like to point out
to you that the laws valid in your country
regarding work on high-voltage systems must
be adhered to when working on, or testing,
semi-conductor ignition systems.

As a matter of principle, when working on such
ignition systems, the ignition is to be
switched off.

Included in such work are the following operations:

- * Connection of engine testing equipment
(timing strobe, dwell-tach tester, ignition
oscilloscope etc.)
- * Replacement of ignition system components
(spark plugs, ignition coil, ignition
distributor, H.T. ignition cables etc.)

If it is necessary to switch on the ignition
in order to test the system or make adjustments
on the engine (to the carburetor, for instance),
then lethal voltages are present throughout
the entire system.

This means that the danger of accident exists
not only at the individual components in the
system (e.g. ignition distributor, ignition
coil, trigger box, ignition harness), but also
at the wiring harness (e.g. connection for the
tachometer, diagnostic connector), on terminals,
and on test equipment.

In addition, in the case of the capacitor-discharge
ignition system (CDI), danger of accident is also
present under the following circumstances:

- * Operation of the trigger box without the
ignition transformer.
- * At the trigger box, (removed), relatively
soon after it has been switched off
(capacitor discharge).

Below is a typical terminal diagram of a semi-
conductor ignition system, the dangerous
locations being marked with high-voltage arrows.

We would point out that all semi-conductor
ignition systems, even the older versions, are
to be regarded as dangerous in the sense as
defined by this bulletin.

EFFECTS OF ELECTRICAL AND ELECTRONIC SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En
01.1981

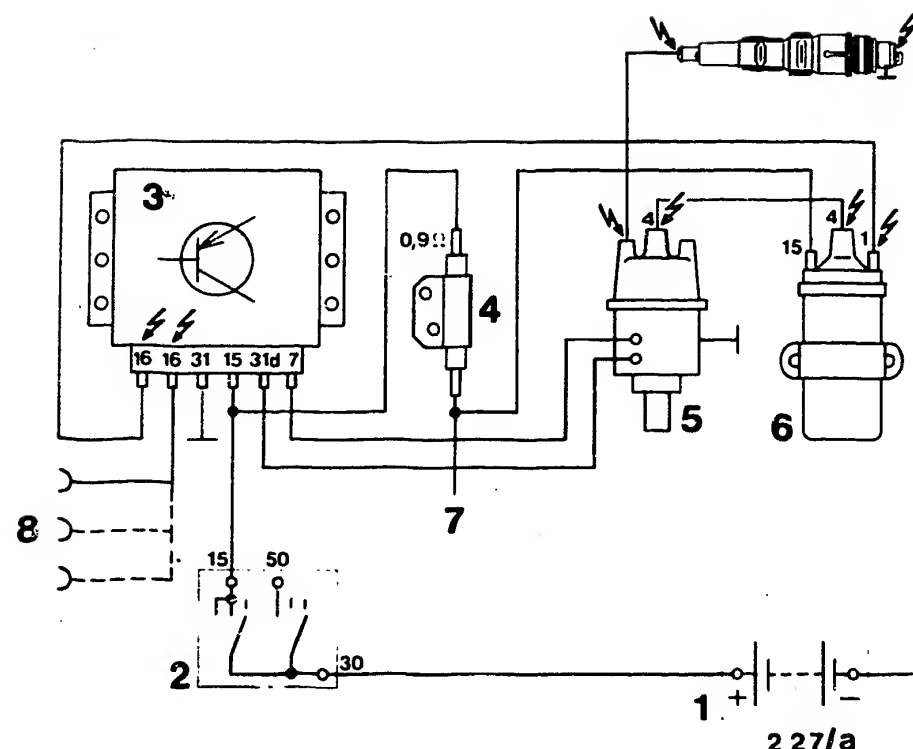
e.g. Ignition systems, Jetronic, Motronic, ABS

Please ensure that this Bulletin is passed
on to your employees for their attention.

We have often been asked by some of our
customers whether or not patients with heart
pacemakers are endangered in any way by
ignition systems. This theme was recently
the subject of an examination carried out by
the Ignition System Development Department of
Robert Bosch GmbH in conjunction with Dr.
Thull, lecturer at the Central Institute for
Biomedical Technology at the University of
Erlangen-Nürnberg and Biotronic GmbH & Co.
of Berlin, a manufacturer of heart pacemakers.
The magazine "Biomedizinischen Technik"
(5/80) published the results.

The most important discoveries in this practice
can be summarized from the examination report
as follows:

1. Heart pacemakers corresponding to the
latest state of the art are not affected
by radiation (electromagnetic fields) from
ignition systems.
2. With a stationary engine and the ignition
switched off, the heart pacemaker is not
affected by any part of the ignition system,
even when unintentionally touched. Main-
tenance work in the engine compartment, for
example, can then be carried out without
any danger.



- 1 = Battery
- 2 = Ignition/starting switch
- 3 = Trigger box
- 4 = Resistor
- 5 = Ignition distributor
- 6 = Ignition coil
- 7 = to starting motor term. 15a
- 8 = to tachometer connection
or diagnostic plug
or TD terminal

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments
concerning the contents to our authorized
representative in your country.

3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency). Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers, please introduce the necessary measures.

We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

Published by:

Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

TECHNICAL BULLETIN

NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En
01.1983
Supersedes 5.1981 edition

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbreviated code	Meaning	Switching	Ignition ctrl. and spark adv.	High-voltage dist.
Coil ignition	ZS (CI)	—	Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I * (TCI-i)	I=Induction-type pulse gen.	Electronic (trigger box)	Mechanical (ignition dist.)	Mechanical (ignition dist.)
	TSZ-H (TCI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition dist.)	Mechanical (ignition dist.)

Designation	Abbreviated code	Meaning	Switching	Ignition ctrl. and spark adv.	High-voltage dist.
Transistorized ignition	TZ-I * (TI-i)	I=Induction-type pulse gen.	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in hybrid technique)	TZ-H * (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Breakerless semi conductor ignition with or without knock control	EZ (EI) (EZ-K) (EI-k)	K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributor-less ignition with or without knock control	VZ (FEI) VZ-K (FEI-k)	K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

* Note:

The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).

MOTOR VEHICLE SERVICE INFORMATION

INCORRECT DISPLAY OF ROTATIONAL SPEED AND DWELL ANGLE ONLY WITH TRIGGER BOXES 0 227 100 .. (TCI-1, TCI-h) WITH CURRENT LIMITATION

VDT-I-Gen. 030 En 02.1981

Supersedes ed. 6.1980

For additional information, see VDT-I Gen. 032 En

1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period, the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT 001.00	Rotational-speed	KTE 001.00
001.01	display O.K. with	001.02
001.02	these testers	001.03
001.04		
002.00		

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan	(Hitachi ignition system)
Fiat	(Delco ignition system)	Datsun	(Bosch ignition system)
Ford	(Delco ignition system)	Peugeot	(Bosch/Fairchild ignition system)
General Motors	(HEI ignition system)	Bosch	transistorized ignition system for retrofitting

0 227 100 920

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2. Test instructions

2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min^{-1} to 1200 min^{-1}).

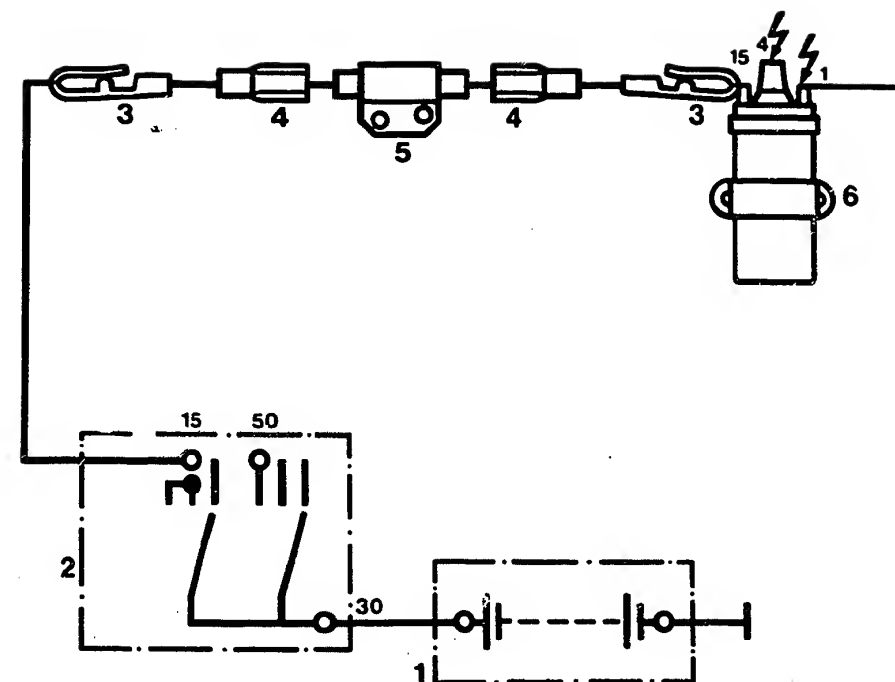
It is, however, possible to attain correct rotational-speed measurements:

Connect a ballast resistor of 0.9 or 1.0 Ohms (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

Suggestion for user manufacture

Required parts:

1 ballast resistor 0.9 Ohms	Part no. 0 227 900 002
or	
1 ballast resistor 1.0 Ohms	Part no. 0 227 900 101
2 blade receptacles	Part no. 1 901 355 881
e.g. approx. 0.2 m cable, 1.5 mm ² e.g.	Part no. 6 210 150 150
2 insulated clips	Commercially available



227/d

- | | |
|------------------------------|----------------------|
| 1 = Battery | 4 = Blade receptacle |
| 2 = Ignition/starting switch | 5 = Series resistor |
| 3 = Terminals | 6 = Ignition coil |

Danger arrows: Warning: 400 V...25 KV

2.2 Dwell angle

The dwell angle is electronically controlled.
The dwell angle is no longer measured.

2.3 Ignition timing

Is correctly indicated. Tester connections according to operating instructions.

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MOTOR-VEHICLE SERVICE INFORMATION

MOTORTESTER CONVERSION

VDT-I-Gen. 032 En

Incorrect indication of engine speed,
dwell angle and ignition point
only with trigger boxes

06.1980

0 227 100 .. (TCI-I, TCI-H) with current limitation

For additional information see

VDT-I-Gen. 030 of 06.1980

Concerns: Motortester EFAW 268

268 S 10

269

214 B

AE 2000

1. General

Please arrange for above-quoted motor-testers in your workshop as well as at your customers (e.g. motor-vehicle workshops, petroleum companies, gas stations, vocational schools etc.) to be converted. Conversion is subject to payment and is performed by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with installation of switch).

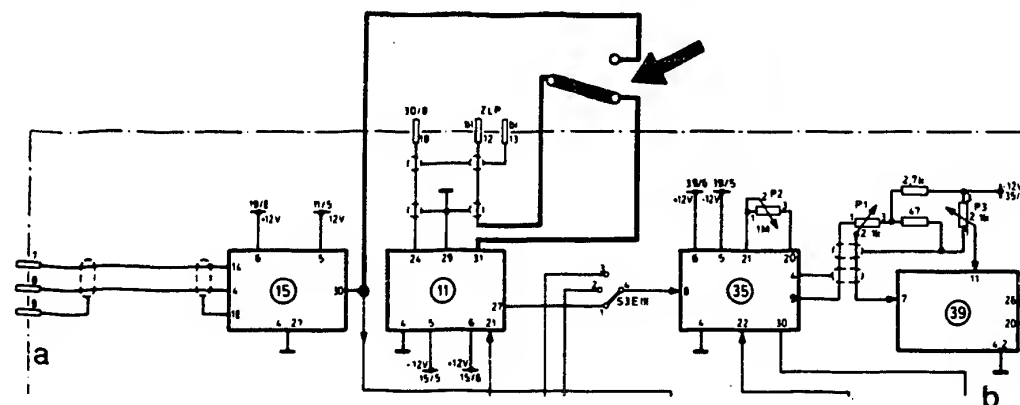
2. Why convert motortesters?

Transistorized ignition systems with current limitation have a different primary-voltage characteristic from conventional ignition systems. During the dwell period, the voltage at terminal 1 of the ignition coil may assume values between 1.5 V and battery voltage (or greater), which, when checking the ignition system, may lead to an incorrect indication of engine speed and dwell angle and to incorrect triggering of the counter.

There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing strobe is triggered by the signal-path dwell-angle meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing strobe is triggered by the clamp-on induction pickup and the pulse shaper stage.



227/e

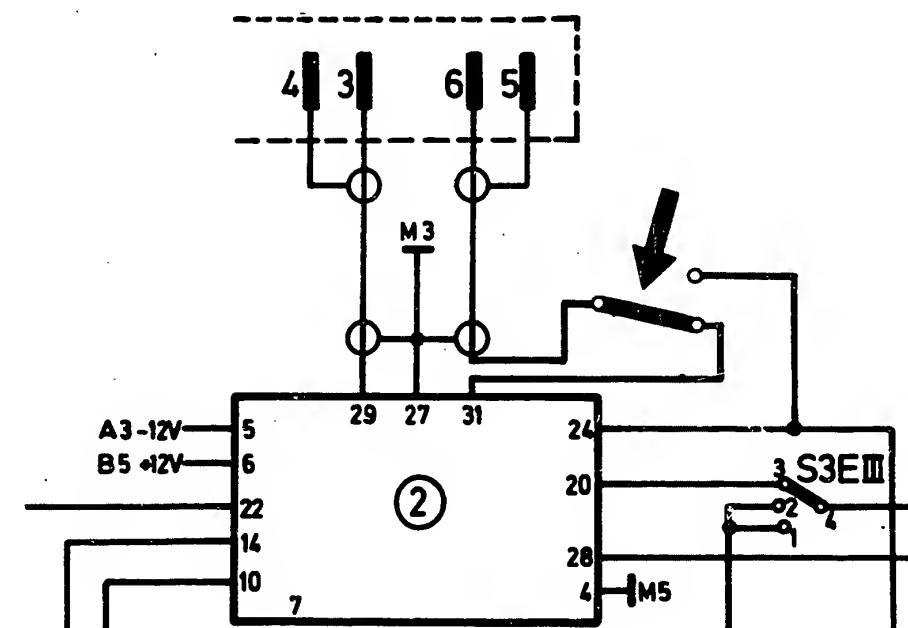
a = Clamp-on induction pickup
b = (Extract from WJF 508/1, Page 53)

EFAW 268, 268 S 10, 269, AE 2000

Remove the line of the ZLP from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803).

In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact.

Arrow points to switch with change-over contact.



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(Extract from WJF 503/1, Page 64))

EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803).

In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact.

Arrow points to switch with change-over contact.

By fitting the switch with change-over contact in the front panel of the motortester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly:
e.g. "Standard" - "Current limitation".
These conversion measures have already been published in the K7 information sheet KJF 28/7911.

4. Test instructions

4.1 Standard ignition systems

Switch position: "Standard".

All other tester connections as per operating instructions.

4.2 Ignition systems with current limitation

Switch position: "Current limitation".

In order to trigger the timing strobe, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

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MOTOR VEHICLE SERVICE INFORMATION

TESTS ON ELECTRONIC IGNITION
SYSTEMS (TCI, TI)
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En
03.1981

The following tests are listed in older and current Tester operating instructions or in "Trouble-shooting with the oscilloscope":

- * "Separate ignition coil test"
(Concerns EFAW 213, 214, 268, AE 2000)
- * Calculating the "ignition voltage reserve"
(Concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- * "Intensified insulation test"
(Concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays, transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7 Information K7-VJF 17/8012.

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MOTOR-VEHICLE SERVICE INFORMATION

VOLVO SERIES 400
ENGINE B 18 FT

Motor vehicle: pass. car
06.1989
0170 En

Engine missing

The following ignition problems may be encountered on Volvo 440, 480 vehicles with engine B 18 FT:

1. Engine missing when accelerating in engine-speed range 2000...2500 min⁻¹ or above 4000 min⁻¹. In such cases, there is no throttle pick-up.

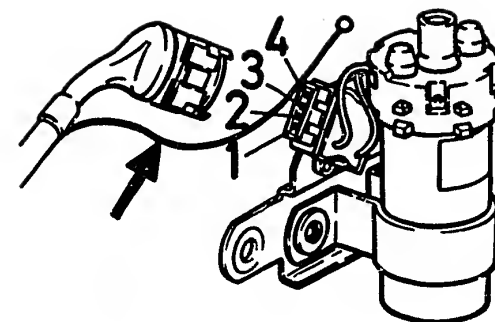
C a u s e:

Interference via lead term. 1 of TI trigger box. The spark plugs should be checked for thermal overload if such malfunctions occur.

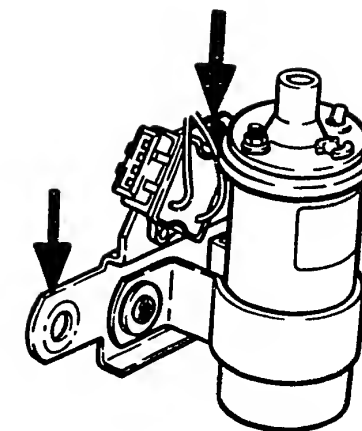
2. The engine may cut out or won't start on connecting up the engine tester.

C a u s e:

The ignition system is destroyed by the additional capacitive of load of the engine tester.



a



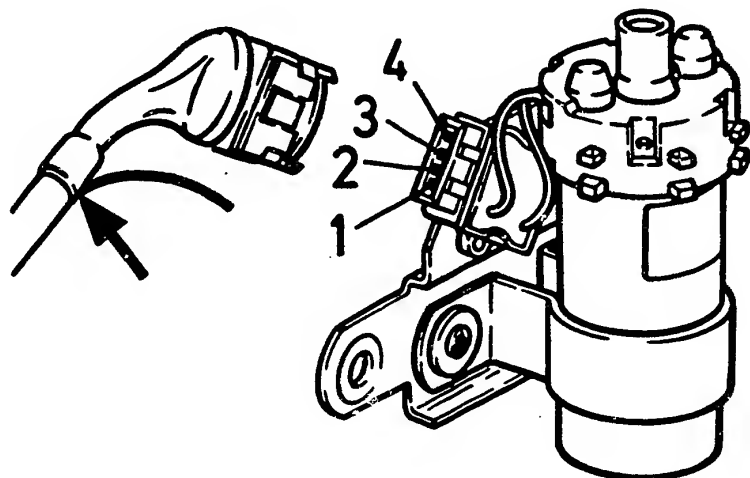
b

227/1302

Remedy for fault items 1 and 2:

Detach trigger-box plug, push back rubber sleeve and cut off cable term. 1 (shield connection) at trigger-box plug.

Extend (picture a, arrow) cut-off cable (shield) such that it can be screwed by means of an electric terminal to the e x i s t i n g hole in the trigger-box heat sink or to the ignition-coil mount (picture b, arrows).



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Seal extended cable at wiring-harness outlet
using silicon for example (see picture, arrow).

For production reasons:
continued on the following
coordinate.

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For production reasons:
continued on the following
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